(54) Surfacecoveringsystemandmethodsofinstallingsame

(57) A surface covering system is described which involves a series of interconnected tiles (1,2) having a spline system located between the tiles (1,2) to simulate the appearance of grout. Each tile (1,2) has on its sides, at least one tongue section and at least two groove sections (7) wherein the tongue section of one tile (1,2) interconnects with the groove section (7) of a second tile (1,2) and further forms a gap at least at the upper surface between the two tiles (1,2). A first spline (3), having two tongue sections (11) for interconnecting with the groove section(s) (7) of at least one tile (1,2), is inserted between a series of tiles (1,2). A second spline capable of fitting into the gap formed between two or more tiles (1,2), which are interconnected at a tongue of a first tile and a groove of a second tile is further used. Methods of installing the surface covering system of the invention arefurtherdescribed.

2D Drawing showing the spline inserting in the grooves of the square tiles

Fig. 10
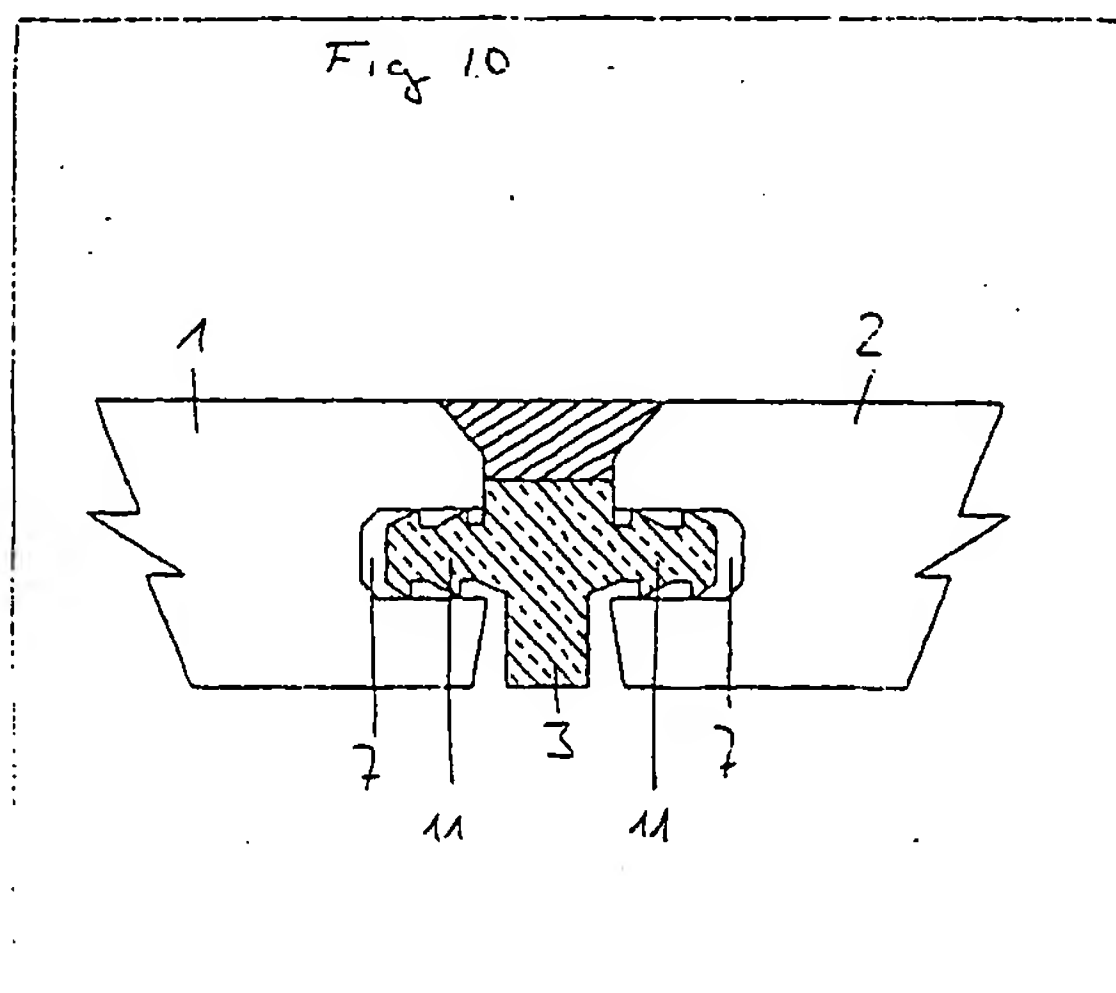
EP 1146182 A2

Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to surface coverings and more particularly to surface covering systems which include surface tiles and systems for joining the tiles together to form an overall surface covering.

[0002] Laminate flooring continues to grow in popularity as a flooring product due to its ease of installment as well as its performance. Furthermore, the various designs which are available for laminate flooring also enhance its popularity with consumers since designs include wood-grain patterns, slate, marble, mosaic, granite, and the like. The use of such laminate flooring generally involves not only emulating the appearance of the slate, marble, and the like, but further requires emulating the joints which exist between the various tiles.

[0003] Conventional ways of making simulated grout tiles include using printed grout that becomes part of the overall tile product. In other words, the simulated grout is printed onto a tile along with the simulated design of the marble, slate, and the like. Another method of simulating grout tiles is to apply hot melt or liquid grout materials to fill the gap between two tiles. However, these conventional methods of simulating grout have many disadvantages. For instance, the printed grout has a fake appearance and therefore does not simulate grout very well. In particular, the printed grout is on the same plane as the tiles, and even though the grout may be embossed with a different texture, there is still no differentiation with the plane of the grout and the printed pattern such as marble or slate. In addition, printing grout along with a design of slate or marble, for instance, leads to low manufacture efficiency and yield because to cut the square tiles from a big laminate board requires expensive sensors to register the printed board to the cutting saw. Furthermore, there is little tolerance allowed with aligning the board for proper cutting and the dimensional growth of the printed paper in both longitudinal and latitudinal direction during the impregnation process makes the registration cutting even tougher.

[0004] Furthermore, with a liquid grout system, the material consists of polymers and carriers wherein the material becomes solid after the carrier is evaporated. Needless to say, there are many problems associated with liquid systems. Further, they are very labor intensive and pose a problem with clean-up since a person must manually apply this material to the gap between the material. Furthermore, there have been concerns that the liquid material can be too soft after curing and therefore may not withstand performance requirements. In addition, the intersection between four floor tiles ("+" intersection), can be a problem and messy since there is distortion in the liquid grout being applied. Also, some liquid fillers can cause staining of the top surface of the tiles. For instance, conventional cement base ceramic tile grout, an example of a liquid type grout material, is

difficult to apply and to clean up, and the application of the grout is very labor intensive and time consuming.

[0005] With hot melt type heat weld systems, such as thermoplastics, hot melt grout is a solid material at room temperature and thus needs to be liquefied by heating. Also, there can be slight distortion at the "+" joints and some pin holes in the finished grout which can be unacceptable both from a visual and maintenance perspective. The pin holes are caused by the evaporation of entrapped moisture and/or gas from the extrusion process of making the hot melt rod.

[0006] Accordingly, there is a need to provide a grout system for all types of surface coverings using tiles that can overcome one or more of the difficulties described above.

SUMMARY OF THE INVENTION

[0007] A feature of the present invention is to provide a surface covering system that is inexpensive to apply and is not labor intensive.

[0008] Another feature of the present invention is to provide a surface covering system that is more realistic with respect to the grout areas, and provides a three-dimensional look.

[0009] Another feature of the present invention is to provide joints for grout which are capable of being sealed by various means, such as heat welding, solvents, adhesives, or other techniques, such as ultrasonic or electromagnetic systems.

[0010] Another feature of the present invention is to provide a system which overcomes the difficulty of applying a simulated grout look to the gap between tiles.

[0011] Additional features and advantages of the present invention will be set forth in the following description, and in part will be apparent from the description, or may be learned by practice of the present invention. The objectives and other advantages of the present invention will be realized and obtained by means of the elements and combinations particularly pointed out in the written description and appended claims.

[0012] To achieve these and other advantages and in accordance with the purposes of the present invention, as embodied and broadly described herein, the present invention relates to a surface covering system. The surface covering system includes a series of tiles wherein each tile has at least one tongue section and at least two groove sections, for example, one tongue section and three groove sections. The tongue section of one tile interconnects with a groove section of a second tile wherein when the two tiles are interconnected a gap is formed at least on the upper surface between the two tiles. The surface covering system further includes a first spline having two tongue sections for interconnecting with the groove sections of at least two tiles. Also, the surface covering system includes a second spline capable of fitting into the gap formed by two or more tiles. This second spline is located between two or more tiles

which are interconnected at a tongue of a first tile and a groove of a second tile.

[0013] The present invention further relates to a method for installing a surface covering system such as the one described above. This method of installing a surface covering system of the present invention involves connecting a series of tiles together to form a line, wherein the tiles are connected together at the tongue of one tile and the groove of another tile and so on. A tongue section of a first spline is then inserted into the grooves of two or more tiles in this series of tiles. The groove of a second series of tiles is then connected into the other tongue section of the first spline. The second series of tiles is further connected to each other to form a line by connecting the tongue of one tile to the groove of another tile and so on. The second spline is inserted into each of the gaps formed between the tiles wherein this second spline may be arranged in a perpendicular direction to the first spline when a system of square or rectangular tiles are used for the system. When other shapes of tiles are used, such as diamond-shaped tiles, the first and second splines are not necessarily perpendicular to each other. Once inserted, the second spline can be bonded, melt-bonded, adhered, or cured in order to be permanently located between the tiles.

[0014] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are intended to provide further explanation of the present invention, as claimed.

[0015] The accompanying drawings, which are incorporated in and constitute a part of this application, illustrate several embodiments of the present invention and together with the description, serve to explain the principles of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

Figures 1(a), (b), and (c) through Figures 3(a), (b), and (c) are partial side views of various tiles of the present invention and show the groove and/or tongue portion of the tiles of the present invention.

Figures 4(a) and (b) through Figures 6(a) and (b) are partial side views of various tiles of the present invention showing the tongue and/or groove sections of the tiles along with the first spline sections (Figs. 4a, 5a, and 6a) and the second spline sections (Figs. 4b, 5b, and 6b) which can be inserted between two or more tiles.

Figures 7(a) and (b) through Figures 9(a) and (b) are side views of the first and second spline sections, which can have a variety of designs.

Figure 10 is a two dimensional view of an assembly having a first spline inserted into the grooves of a square tile.

Figure 11 is a perspective view of the assembly of Figure 10.

Figure 12 is a two dimensional view showing a partial side view of a tongue portion of a tile.

Figure 13 is a perspective view of the same portion of the tile as shown in Figure 12.

Figure 14 is a two dimensional view showing a second spline design.

Figure 15 is a perspective view of the spline of Figure 14.

Figures 16 through 18 represent cross-sectional views of various designs of the first spline.

Figure 19 is a two dimensional view showing a partial side view of two tiles and opposing groove portions of each.

Figure 20 is a perspective view of a tile shown in Figure 19.

Figures 21 through 23 are partial side views of various designs of grooves that can be present in the tiles of the present invention.

Figure 24 is a perspective view of a tile having three sides with grooves and one side with a tongue section.

Figure 25 is a perspective view of a tile further showing the tongue section of the tile, as well as the groove sections.

Figure 26 is a side view of an assembly having a second spline lying in a gap formed between two tiles.

Figure 27 is a perspective view of the assembly shown in of Figure 26.

Figure 28 is a perspective view of three designs of the first spline section.

Figure 29 is a perspective view of a long first spline having a notch formed therein for receiving the second spline.

DETAILED DESCRIPTION OF THE PRESENT INVENTION:

[0017] The present invention relates to a surface covering system, preferably involving a series of tiles with spline joints located between the tiles. The spline joints preferably simulate grout or mortar. The present invention further involves a method of installing the surface coverings.

[0018] In more detail, the surface covering system, as shown in Figs. 4a and 4b, has a series of tiles 1, 2, a first spline section 3 and a second spline section 4, which are all interconnected. The tiles that are used are such that each tile preferably has four sides, a top surface 5 and a bottom surface 6. Three of the sides have groove sections 7 and the other side has a tongue section 8. The tongue section 8 of one tile interconnects with a groove section 7 of a second tile. Furthermore, the tongue and groove sections (7, 8) are designed such that when they interconnect with each other, a gap is formed in the upper surface between the two tiles in order to receive a spline section 4 as will be described in

moredetailbelow.

[0019] The tiles 1, 2 preferably have four sides and are preferably rectangular in shape, for example, square. Tiles of other shapes, including triangles, hexagons, octagons, pentagons and other polygons can be used. Combinations of tiles of different shapes can also be used in the flooring system of the present invention, such as a combination of octagon shapes and square shapes. Preferably, the tiles are of such shape or shapes that when a row or line of tiles are connected together, a continuous row or line of groove sections 7 is provided and adjacent tiles of the row or line can share thesamefirstspline3.

[0020] The tiles can be made of any material that can be used for surface coverings. For instance, the tile can be a laminate tile, which is a particle board having various layers located on top including a print layer having a design to simulate granite, wood, brick, and the like. Any design can be used on the print layer. The tile can also be made of a polymeric material such as a thermoplastic material. Generally, any thermoplastic material, combinations thereof, alloys thereof, or mixtures of two or more thermoplastics can be used to form the tile. Generally, such thermoplastic materials include, but are not limited to, vinyl containing thermoplastics such as polyvinyl chloride, polyvinyl acetate, polyvinyl alcohol, and other vinyl and vinylidene resins and copolymers thereof; polyethylenes such as low density polyethylenes and high density polyethylenes and copolymers thereof; styrenes such as ABS, SAN, and polystyrenes and copolymers thereof; polypropylene and copolymers thereof; saturated and unsaturated polyesters; acrylics; polyamides such as nylon containing types; engineering plastics such as acetyl, polycarbonate, polyimide, polysufone, and polyphenylene oxide and sulfide resins and the like. One or more conductive polymers can be used to form the tile, which has applications in conductive flooring and the like. The thermoplastic polymers set forth in Kirk Othmer (3rd Edition, 1981) at pp. 328 to 848 of Vol. 18 and pp. 385-498 of Vol. 16, (incorporated in their entirety by reference herein) can also be used as long as the resulting tile has sufficient strength for its intendedpurpose.

[0021] The surface covering system of the present invention can be used as floor coverings, wall coverings, ceilingcoverings,kitchencountertops,andthelike.

[0022] The tiles used in the present invention can be of any size including conventional sizes. For instance, the tiles can range in size of from about 2" x 2" (50.8 mm x 50.8 mm) to about 48" x 48" (1219.2 mm x 1219.2 mm), and more preferably from about 6" x 6" (152 mm x 152 mm) to about 24" x 24" (609.2 mm x 609.2 mm), and most preferably from about 12" x 12" (304.8 mm x 304.8 mm) to about 16" x 16" (406.4 mm x 406.4 mm). The thickness of the tile can be any conventional thickness such as from about 0.158" (4 mm) to about 0.472" (12 mm) and more preferably from about 0.276" (7 mm) toabout0.355"(9mm.).

[0023] With respect to the groove section 7 that is preferably on three sides of the tile, these groove sections 7 can be of any dimensions as long as the receiving tongue section 8 can either be inserted into the groove section 7 of a second tile in order to connect two or more tiles, or inserted into a spline section 3 to be discussed below. The groove sections 7 on three sides of the tiles generally are located in the middle portion of the side of the tile and the height of the recessed portion forming the groove section is from about 0.095" to about 0.255", and more preferably from about 0.098" to about 0.102". The depth of the recessed portion, that is, how far the groove is recessed into the side of the tile, is from about 0.1500" to about 0.210", and more preferably from about 0.1800" to about 0.1900". Preferably, the groove section 7 runs along the entire length of each of three sides of each tile. The recessed portion can have a variety of designs to interface with the receiving tongue section. For instance, as shown in Figures 19 and 20, the groove section can be in the form of a sideways letter "U" and can have various angular cuts as represented in Figures 19 and 20. Other designs of the groove are further set forth in Figures 21 through 23 where Figure 21 also shows a smooth groove in the shape of a sideways letter "U". Figure 22 shows a tooth-like groove and Figure 23 shows a recessed groove also having teeth. Figure 24 further depicts the sides of a preferred tile wherein it can be seen that the grooves run the entire length of three sides of the tile and the fourth side has a tongue section as more clearly shown in Figure 25. Figures 26 and 27 depict how the tongue portion of one tile connects with thegroovesectionofasecondtile.

[0024] As shown in Figures 1 through 3, the groove section 7 of the tile can have various angular cuts. For instance, as shown in Figure 2(a), the tile near, the upper surface of the sides, has a tapered cut on each side in order to form a more defined trapezoidal gap between two tiles when they are interconnected as shown in Figure 2(b). Figure 3(a), likewise, shows a tapered upper side section wherein the length of the tapered cut is shorter.

[0025] With respect to the tongue section 8 of each tile, as stated above, the tongue section 8 is designed such that it will interconnect with a groove section 7 of a second tile. Figures 12 and 13 provide a preferred design of the tongue section where it can be seen that preferably the upper surface of the tongue is more recessed than the lower portion as shown in Figure 12. Generally, the upper surface will be twice as exposed as the lower surface in forming the tongue portion. The thickness of the actual tongue portion which inserts into the groove will preferably be of a size to snugly and tightly fit into the groove in order to interconnect the two tiles together. Accordingly, the tongue portion will have very similar thicknesses to the height of the recessed portion and can be as long as the depth of the recessed portion. The tongue and groove are designed such that when the two interconnect, a gap is formed as shown in Figures 1(a),

2(a),and3(a).

[0026]   The surface covering system of the present invention is preferably designed such that a series of tiles 1, 2 are interconnected to form a straight line of tiles. The tiles 1, 2 are connected with each other by fitting the tongue 8 of one tile into the groove 7 of another tile and so on. This line of tiles then has a groove section 7 on each side of the series of tiles forming the line. A first spline 3 is then designed to have two tongue sections 11 on each side. Each of these tongue sections 11 is designed to interconnect with one or more groove sections 7 of tiles 1, 2. Preferably, the first spline 3 is designed to have a length such that it interconnects with the groove sections 7 of at least two tiles and more preferably with at least three tiles. The spline section 3 can be designed to have a length such that it can interconnect a line of tiles from two tiles to twelve tiles or more. The first spline section 3 as depicted, for instance, in Figure 29, is designed such that there are one or more intermittent notches 12 present on the upper surface of the first spline. This notch is of sufficient width and depth to receive a second spline 4 on top such that when the second spline 4 is placed in the notch 12, the upper surfaces of the first and second splines 3, 4 are even with one another. These notches 12 are intermittently present in design to address the gaps which form a "+" intersection between multiple tiles, such as four tiles. Thus, the notches are preferably spaced apart accordingtothelengthofeachtile.

[0027]   The designs of the tongue sections 11 of the first spline 3 can be of the same design, essentially, as the tongue section 8 of the tiles 1, 2. Various designs are set forth in Figures 4(a) through 6(a). As can be seen in these figures, the groove sections 7 of two tiles are interconnected by means of the first spline 3 which preferably is of a design such that the bottom surface of the first spline 3 rests between the bottom surfaces of the first tile 1 and second tile 2 being interconnected. Preferably, the upper and lower surfaces of the tongue sections 11 of the first spline 3 comprise a soft polymer in order to ensure a tight fit between the groove sections 7 of the tile. The tongue sections 11 of each first spline 3 are designed so as to have a thickness and depth that will generally match the height and depth of the groove sections 7 of the tiles 1, 2. Furthermore, the upper surface of the first spline 3 preferably has a concave surface in order to simulate the concave surface of grout. This can be seen in Figures 4(a) through 6(a). The interaction of the first spline 3 with two tiles is further set forth in Figures 10 and 11. Generally, the first spline 3 can simply be connected with the groove sections 7 of two or more tiles. However, adhesives or other bonding material can further be applied to the tongue sections 11 of the first spline 3, as well as to the tongue and/or groove sections of any of the materials in order to ensure amorepermanentconnection.

[0028]   As indicated earlier, a second spline 4 is used in this surface covering system to simulate the same grout or mortar simulated by the first spline 3. The second spline 4 fills in gaps between tiles that run perpendicular or at an angle to the first spline 4, as can be seen in Figure 29. This second spline 4 fits over the gap created by the interconnection of the tongue section 8 of one tile and the groove section 7 of a second tile as shown in Figures 1(b) through 3(b). The second spline 4 does not have any tongue or groove sections, but instead is a piece of material that simply fits between the gap created by two connecting tiles. One preferred design having a type of trapezoidal shape is set forth in Figures 14 and 15. This spline 4 can be placed over the gap running perpendicular to the first spline 3 and, as indicated earlier, can be of such a length that it fits over notches 12 located on the first spline 3 at every intersection of four tiles. This second spline 4 is simply inserted or placed into the gap and then can be permanently affixed by various techniques. For instance, insertion of the second spline 4 can be made permanent by application of adhesive material such as glues; by hot welding; or methyl ethyl ketone, methyl amyl ketone, dipropyl ketone, methyl isobutyl ketone, n-methyl pyrrolidone, dimethyl formamide, cyclohexanone, nitrobenzene,andthelike.

[0029]   The second spline 4 can be of any length and preferably has a length equal to at least one tile or tile and half, and more preferably at least two tiles, but can be the length of one tile to twelve tiles or more. The material used to make the second spline 4 is generally the same type of polymeric material used to make the first spline 3. The upper surface of the second spline 4 can also be concave as shown in Figures 4(b) through 6(b). Again, this is done to simulate the appearance of grout ormortar.

[0030]   Generally, any sequence of steps can be used to insert the tiles 1, 2, and the first and second splines 3, 4. One way of installing the surface covering system, which can be done in any order, involves connecting a series of tiles to essentially form a line, wherein the tiles are connected together at the tongue 8 of one tile 1 and the groove 7 of another tile 2 opposite its tongue, and so on, to form a row or line of tiles. The tongue section 11 of a first spline 3 can then be inserted into the series of grooves 7 formed on one side of the line of tiles. A second series of tiles can then be formed and inserted, by way of one series of grooves 7, into the other tongue section 11 of the first spline 3. Again, the second series of tiles are also connected to each other by connecting the tongue of one tile to the groove of another tile to form a straight or essentially straight line or series of interconnected tiles. These steps can be repeated in any order to connect any number of tiles together. The second spline 4 can then be inserted into each of the gaps formed between the various tiles wherein these gaps, as indicated earlier, would be running perpendicular to the first spline 3 in the case of rectangular tiles, or otherwise running at an angle to the first spline as with diamond-shapedtiles.

[0031] As an option, adhesive or other supplemental bonding material or means can be used during any of these above-described steps to more permanently attach the tiles together and to the spline system. The second spline 4 can then be permanently affixed to the tiles by adhesive material, hot welding devices, melt-bonding, solvents, ultrasonic or electromagnetic techniques, andthelike.

[0032] Preferably, to join two tiles with a first spline 3 having the length of two tiles, the first spline 3 is inserted with one half of the length of the spline in the groove 7 of one tile and the other half in the groove 7 of an adjacenttileinaseriesoftiles.

[0033] For rectangular tiles, the longitudinal ends of the tiles are preferably grooved, and one of the latitudinal ends is grooved, and the other latitudinal end has the tongue portion. The groove configuration of the latitudinal end is the same as the groove configurations of the longitudinal ends. The length of the upper tongue on the tile is equivalent to the size of the grout width plus the typical size of a tongue portion inserted in the groove.

[0034] Preferably the length of the first spline 3 is equivalent to the length of two tiles plus the widths of the grouts between the two tiles. One benefit of the present invention is that the spline does not have to be precisely dimensioned in length prior to installation and can be cut to the exact size during installation. In the tile assembly, the first spline is preferably designed such that when it is the length of two tiles plus grout width, it will be aligned to the first tile thus ensuring a perfect alignment for the latitudinal grout material to lie across in the traverse or perpendicular direction. Since both ends of the first spline are cut or centered to the middle of the notch 12, great flexibility is provided to cover any possible variation of tile dimension. For instance, if the first spline is shorter than the tile size at the end, a small gap may exist from one spline to the next spline. However, the simulated grout top portion of the second spline, which is laid on top, can disguise any possible gaps.

[0035] The splines 3, 4 can be made of any thermoplastic material like vinyl containing thermoplastic such as polyvinylchloride, polyvinylacetate, polyvinylalcohol, and other vinyl and vinylidene resins and copolymers thereof. Other examples of suitable thermoplastic materials include, but are not limited to, polyethylene, such as low density polyethylenes and high density polyethylenes and copolymers thereof; styrenes such as ABS, SAN, and polystyrenes and copolymers thereof; polypropylene and copolymers thereof; saturated and unsaturated polyesters; acrylics and polyamides, such as nylon; engineering plastics such as acetyl, polycarbonate, polyimide, polysulfone; polyphenylene oxide; sulfideresins;andthelike.

[0036] The first spline 3 can preferably comprise a substantially rigid bottom portion and a top portion which is more flexible and/or of lower melting material than the bottom section. Cross-sectional profiles of two-portion first splines are shown in Figs. 16-18. Likewise, the second spline may comprise a bottom portion and a top portion. The top portion of the second spline may be more flexible and/or of lower melting material than the bottom portion thereof. Preferably, the top portion of the first spline and the top portion of the second spline are of the samematerial.

[0037] The first spline may be provided with a connecting device at an end thereof so that the first spline can be connected to another first spline to form a substantially continuous length of first spline. Likewise, the second spline may be provided with a connecting device at ends thereof to enable connecting two or more second splines together. The connecting device for connecting like splines together may be of tongue and groove design, of toothed tongue and notched groove design,orofalikedesign.

[0038] As a further embodiment, the first spline may be a two piece system, wherein the top portion of the first spline is separate from the bottom portion having the two tongue sections. The top portion of the first spline can be installed just like the second spline is installed. This type of embodiment permits any defects between splines to be masked by the top portion of the first spline when placed on top of the lower portion of the first spline. Further, in this embodiment, the length of the upper portion of the first spline can be different fromthelengthofthebottomportionofthefirstspline.

[0039] The present invention will be further clarified by the following examples, which are intended to be purelyexemplaryofthepresentinvention.

EXAMPLES

Example1-SolventW eldingMethod

[0040] JOWAPUR 13 687 00 was sprayed onto the entire surface of the tongue and grooves of the laminate flooring as shown in Figures 24 and 26. JOWAPUR 13 687 00, from Jowat Adhesives, is a hydrophobic material, a foam free polyurethane pre-polymer without residual tack. The viscosity of this material is approximately 40 cps. The sealer preferably penetrates into the HDF and also totally seals the entire surface of the tongue and groove. The spray rate was approximately 0.3 grams to 0.5 grams per tile that has one tongue on one side of three grooves on the rest of three sides of the square tile format. The dimensions of the square tile were 15.71" x 15.71" (399 mm x 399 mm). The sealer that was sprayed on all four edges of each square tile wasallowedtocurefor24hours.

[0041] Lengthwise spline material (composed of rigid and semi-rigid PVC) was then inserted into the grooves of two tiles to interconnect them together. The tongue section of these tiles was also inserted into the groove section of the second tiles to form a larger square tile assembly that consisted of four tiles interconnecting

them together by using both spline and tongue & groove lockingsystem.

[0042] The widthwise spline was then snapped into the recessed areas created by the tongue and groove connectionofthetiles.

[0043] Solvent sealer, THF, was then applied by using an applicator with conical shape or syringe that had a tip of 1/32" in diameter on the top of a 4 oz. bottle. The application rate of THF seam sealer along all joints between tiles in lengthwise and widthwise was about 0.20 gramsto0.70gramsperboard.

[0044] The tiles were allowed to sit for 8 hours to develop bond strength between the square tiles and spline system. The bond strength for separating the tiles from thejointwasabout131psi.

Example II-HeatW eldingMethod

[0045] The laminate was the same as Example 1 and was pre-treated with pre-polymer and cured in the same mannerasinExample1.

[0046] The lengthwise spline material, based on Exxon's Escorene LD 723 (composed of low density polyethylene/vinyl acetate copolymer), was then inserted into the groove section of the second tiles to form a larger square tile assembly that consisted of four tiles interconnecting them together by using both spline and tongue & groove locking grooves of two tiles to interconnect them together. The tongue section of these tiles was alsoinsertedintosystem.

[0047] The widthwise spline that was also made out of Exxon's Escorene LD 723 (composed of low-density polyethylene/vinyl acetate copolymer) was snapped into the recessed areas created by the tongue and groove connectionofthetiles.

[0048] A heat gun was then used to soften and subsequently melt the edges of the spline material and thus initiate bonding between the spline and tile board surface. The surface temperature of the spline reached about a minimum of 185°F (85°C). Bond strength was then achieved between the square tile and spline system.

[0049] The joint was allowed to be completely cooled down for the full strength of the bond to be developed between the square tile and spline system. The bond strength for separating the tiles from the joint was about 37psi.

[0050] Other embodiments of the present invention will be apparent to those skilled in the art from consideration of the specification and practice of the present inventiondisclosedherein.

[0051] In particular, the surface of the surface covering system according to the invention can be a floor, a wall, a ceiling, or a countertop. The tile can have a printed design on the top surface thereof. The system can have a printed layer on top of each tile and can have the design of brick, granite, slate, marble, mosaic, or woodgrainpatterns.

[0052] In the method according to the invention, the affixing can comprise melt-bonding. Further, the steps canberepeatedoneormoretimes.

Claims

1. A surface covering system comprising a series of tiles, each tile having an upper surface (5), a lower surface (6), and a plurality of sides, wherein at least two of the sides each have a groove section (7) and atleastoneofthesideshasatonguesection(8);

    wherein when the tongue section (8) of one tile interconnects with the groove section (7) of a second tile, a gap is formed on the upper surfacebetweenthetwotiles;
    at least one first spline (3) having two tongue sections (11) for interconnecting with the groovesections(7)ofatleasttwotiles(1,2);
    at least one second spline (4) capable of fitting into said gap formed between two or more tiles (1,2) which are interconnected at the tongue section (11) of one tile and the groove section (7)ofanothertile.

2. The surface covering system according to claim 1, wherein the top edges (9) and/or bottom edges (10) ofeachtilearetapered.

3. The surface covering system according to claim 1 or 2, wherein said first spline (3) and said second spline (4) simulate grout in appearance, and/or comprise thermoplastic material, and/or the upper top surfaces of said first spline (3) and said second spline(4)areconcave.

4. The surface covering system according to at least one of claims 1 to 3, wherein the tongue section (11) of said first spline has a tooth-like design, and/or the tongue section (7) of each tile has a tooth-like design, and/or the tongue sections (11) of said first spline (3) have soft polymer located at top and bottom surfaces of the tongue to be inserted into the groovesection(7)ofsaidtiles.

5. The surface covering system according to at least one of claims 1 to 4, wherein said first spline (3) has a design such that the bottom of said first spline (3) rests between the bottom surfaces (6) of the first tile (1)andsaidsecondtile(2).

6. The surface covering system according to at least one of claims 1 to 5, wherein said groove sections (7)ofeachtile(1,2)haveatooth-likedesign.

7. The surface covering system according to at least one of claims 1 to 6, comprising two or more first

splines(3)connectedtogether.

8. The surface covering system according to at least one of claims 1 to 7, wherein the sides having a groove section (7) is longer at the bottom portion than the top surface portion of the same groove (7).

9. The surface covering system according to at least one of claims 1 to 8, wherein said first spline (3) has a notch (12) located on the top surface to receive saidsecondspline(4).

10. The surface covering system according to at least one of claims 1 to 9, wherein a series of notches (12) are spaced apart on the top surface of said first spline (3) by lengths equivalent to about one tile length.

11. The surface covering system according to at least one of claims 1 to 10, wherein each tile has four sides, three of the sides have groove sections (7), andonesidehasatonguesection(8).

12. The surface covering system according to at least one of claims 1 to 11, wherein said series of tiles includes at least two tiles of different shapes, in particularrectangularorsquaretiles.

13. The surface covering system according to at least one of claims 1 to 12, wherein said first spline (3) comprises a separate top portion and a separate bottom portion, wherein said top portion is affixed tosaidbottomportion.

14. A method of installing the surface covering system according to at least one of claims 1 to 13, comprising:

> connecting two or more of said tiles together to form a row of tiles, wherein the tiles (1,2) are connected together by connecting the tongue section (8) of one tile and the groove section (7)ofanothertile;
> inserting a tongue section (11) of said first spline (3) into a groove section (7) of one or moretilesinsaidrowoftiles;
> connecting a groove (7) of at least a third tile into the other tongue section (11) of said first spline(3);
> connecting a tongue section (8) of a remaining groove section (7) of said third tile to a groove section (7) or a tongue section (8) of a fourth tiletoformasecondrowoftiles;
> inserting at least one of said second splines (4) into each of said gaps formed between said tiles that are not otherwise occupied by said firstspline(3);and
> affixingtheinsertedsecondsplines(4).

15. The method according to claim 14, wherein said second row of tiles is formed before said third tile is connected to said first spline (3) or said third tile is connected to said first spline (3) and then said secondrowoftilesisformed.

Side view showing laminate dimensions for various grout designs

Fig 1

Fig 2

Fig 3

(a)

(b)

(c)
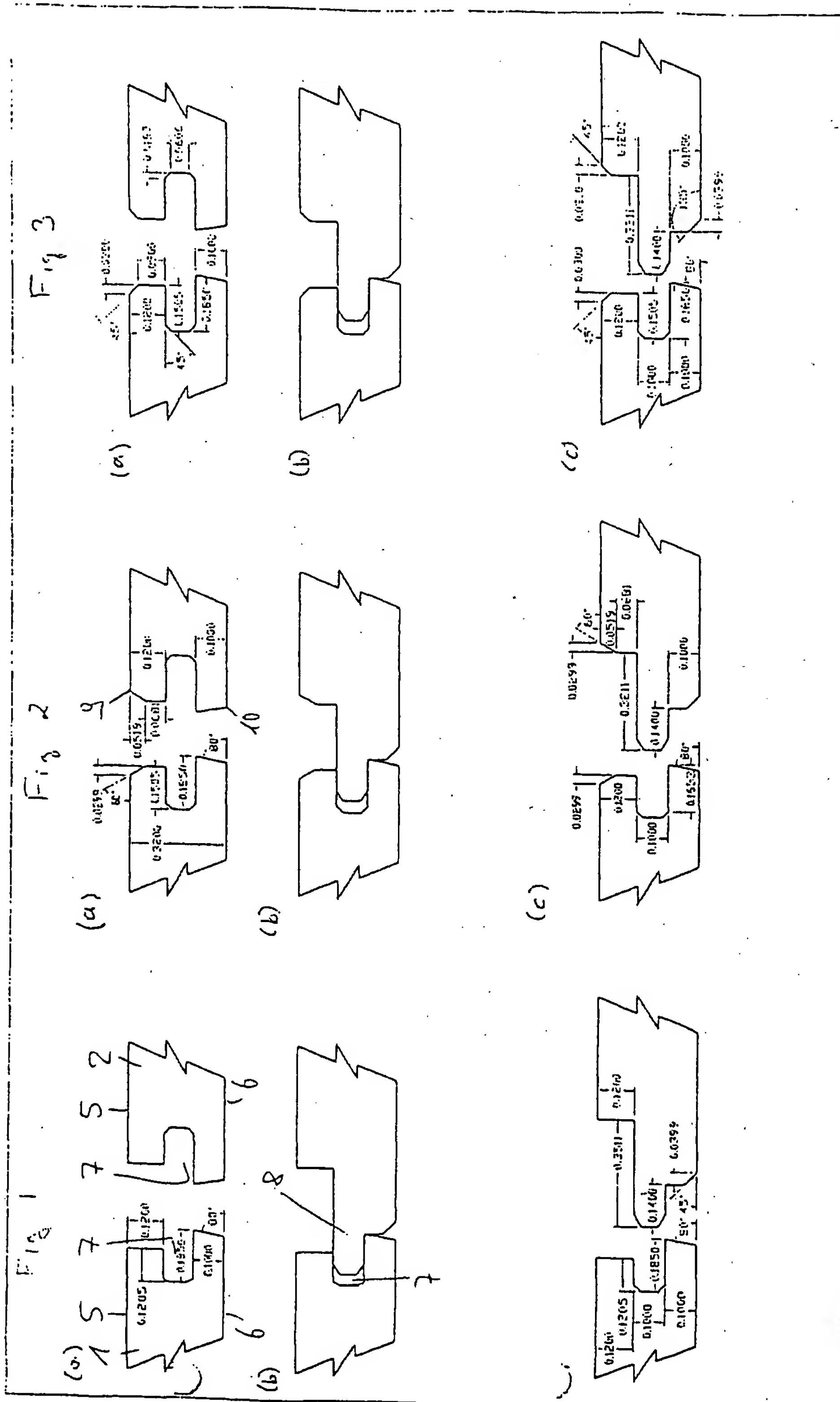
Side view showing various laminate and grout designs

Fig 4

Fig 5

Fig 6
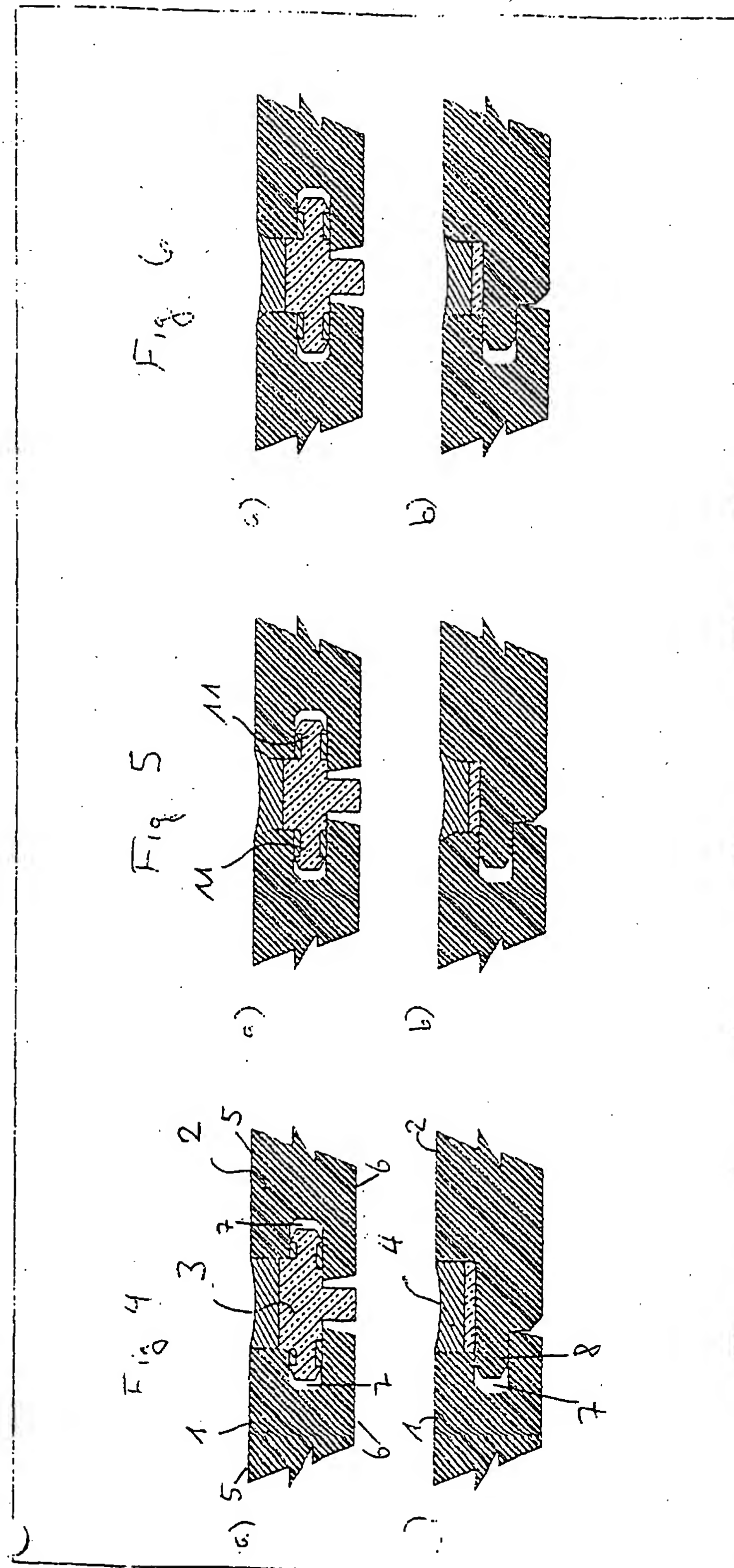
Side view showing dimensions for various grout designs
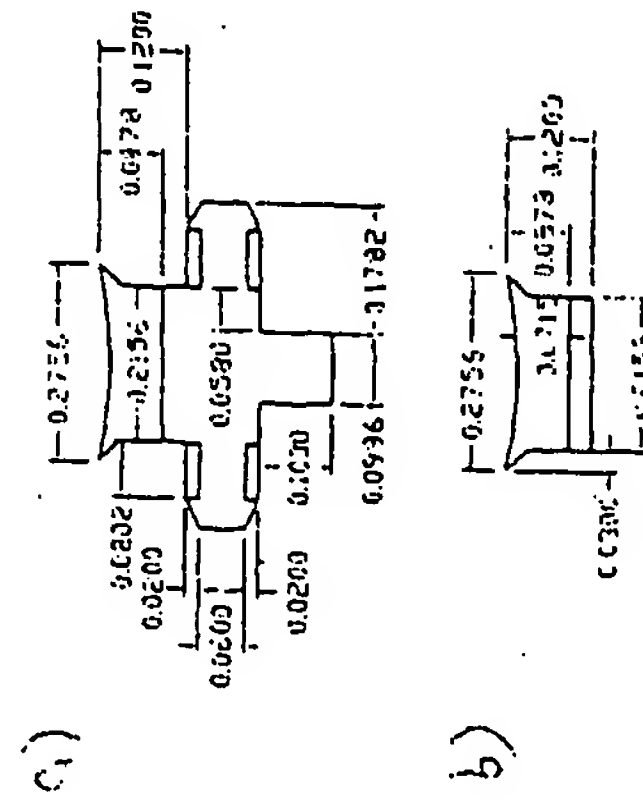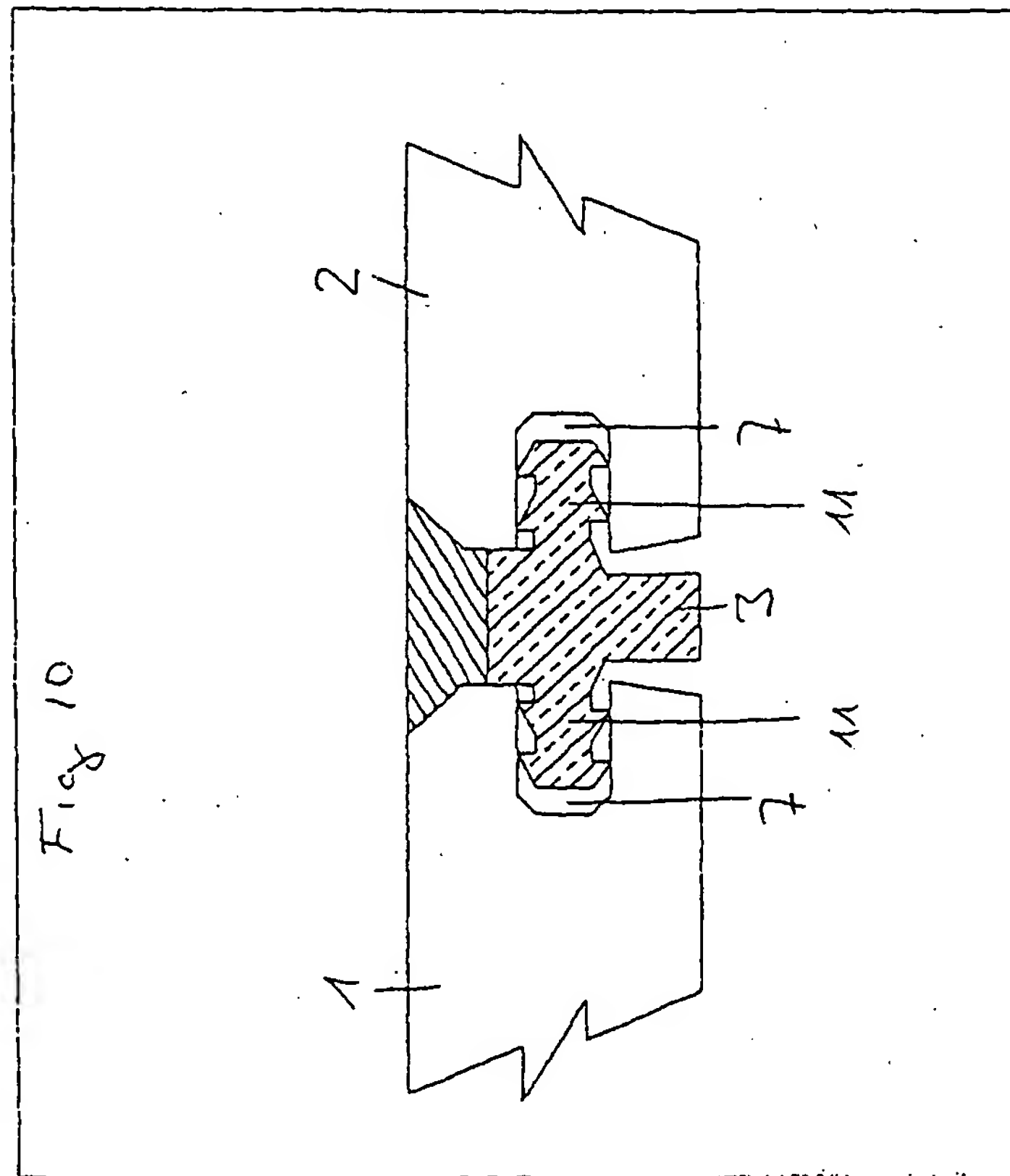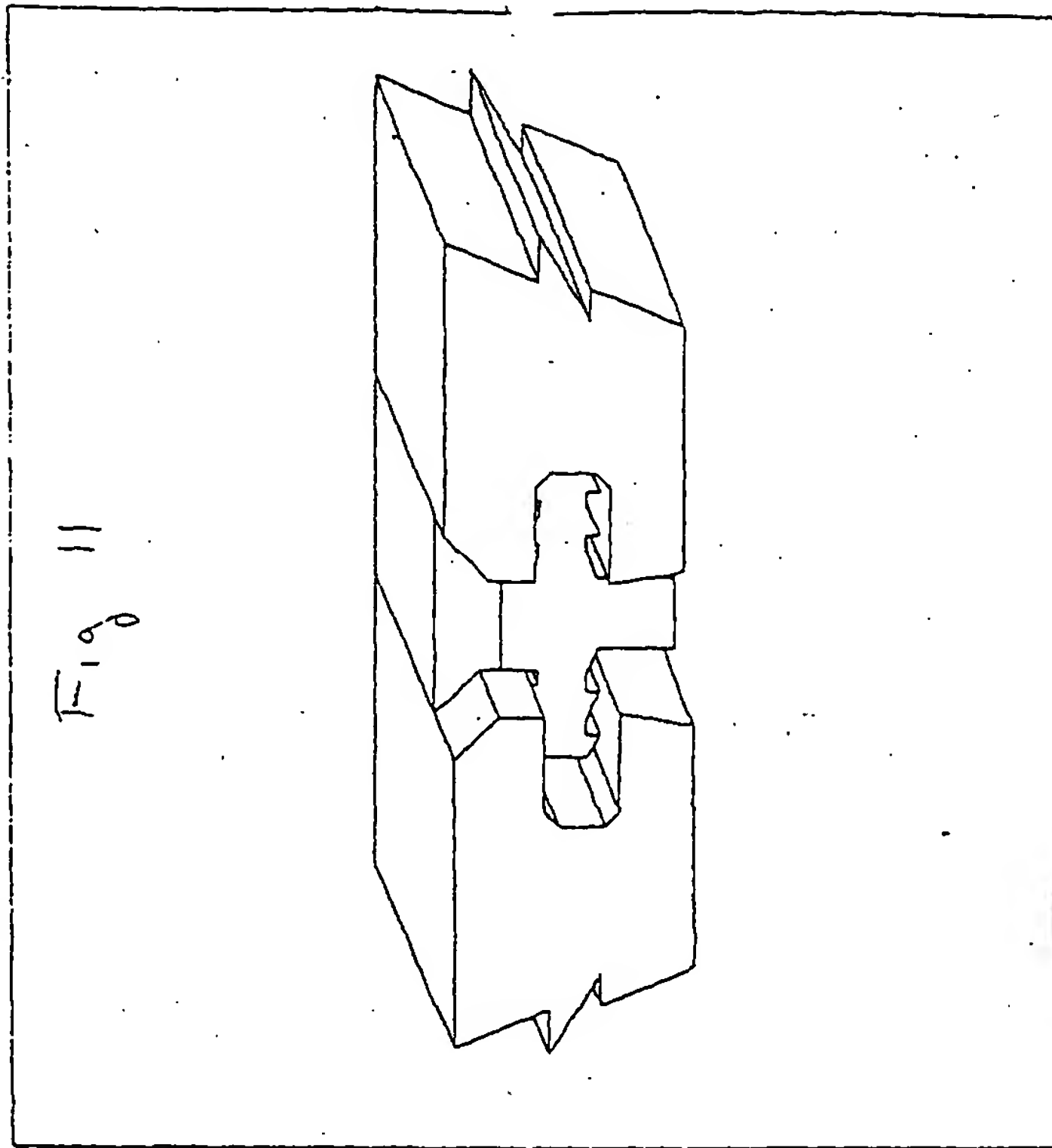

Fig 7
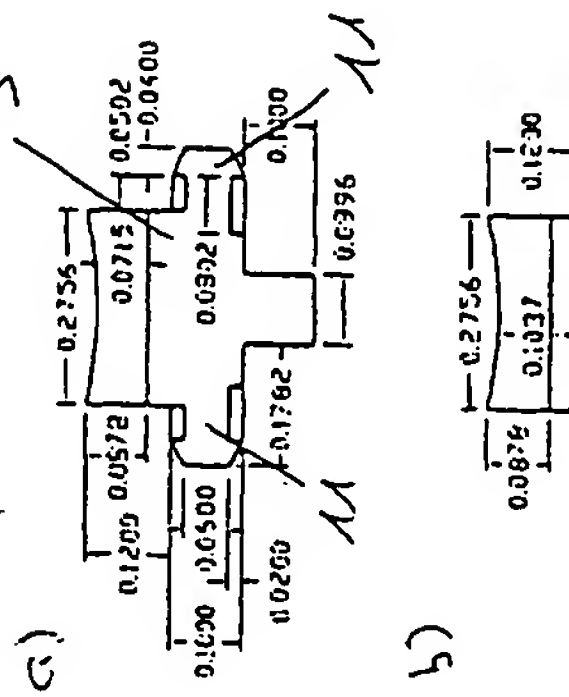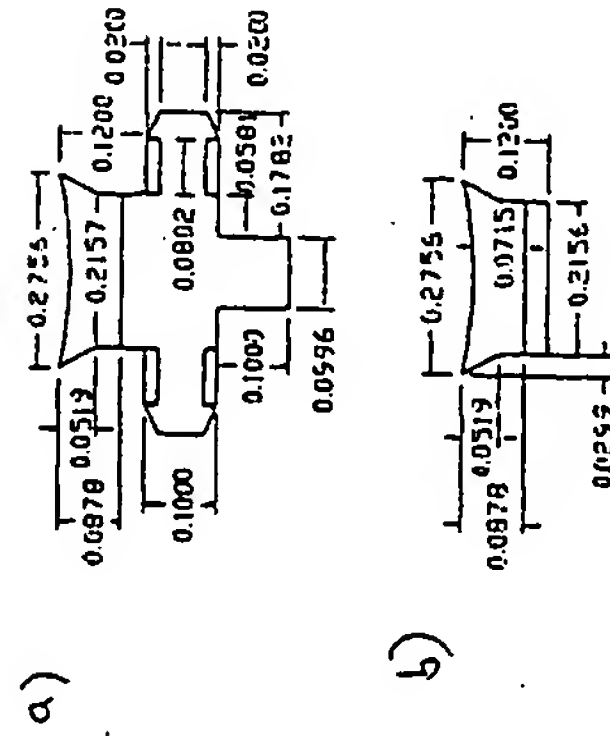
a)

b)

Fig 8

a)

b)

Fig 9

a)

b)

3D Drawing showing the spline
inserting in the grooves of the
square tiles

Fig 11

2D Drawing showing the spline
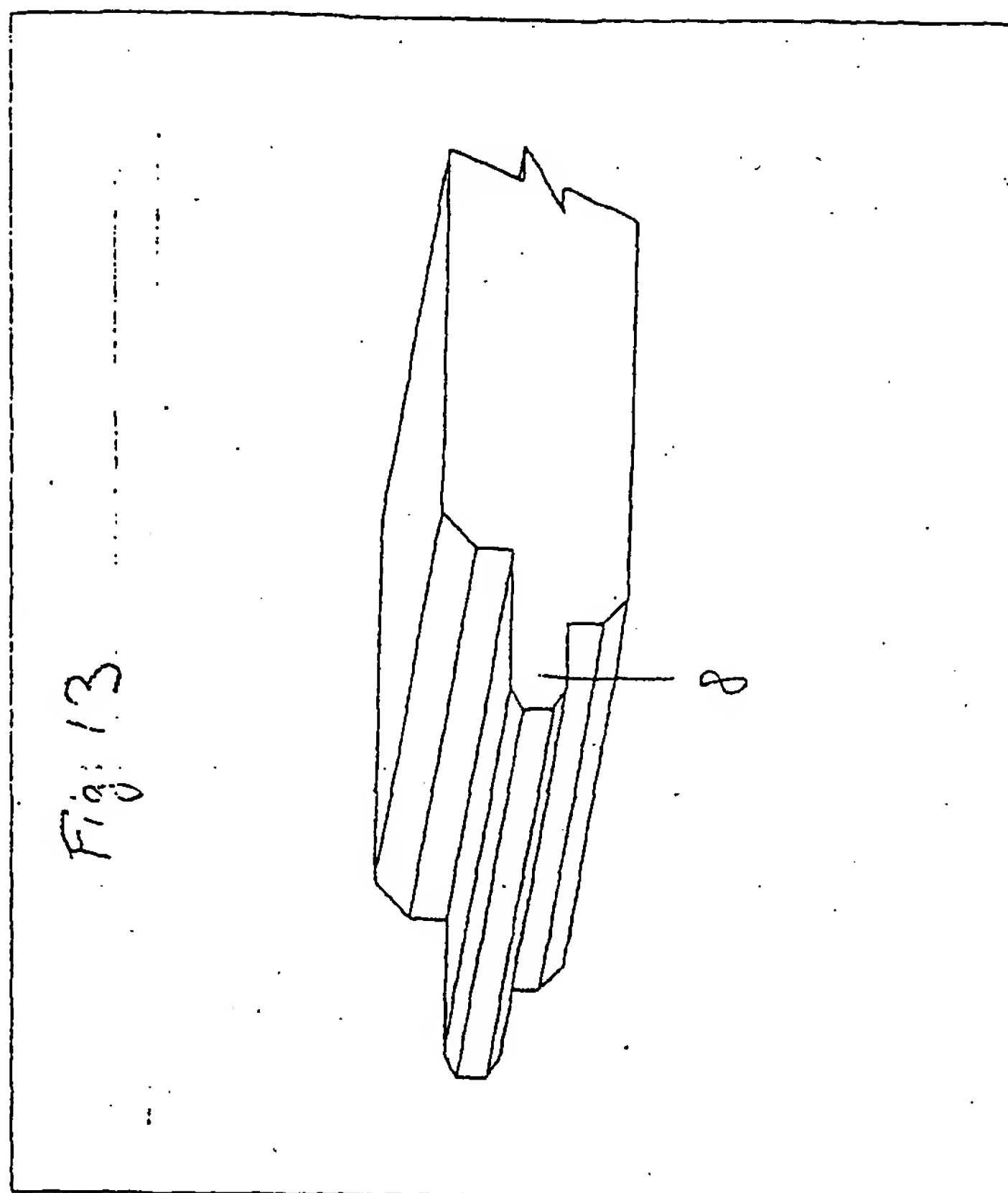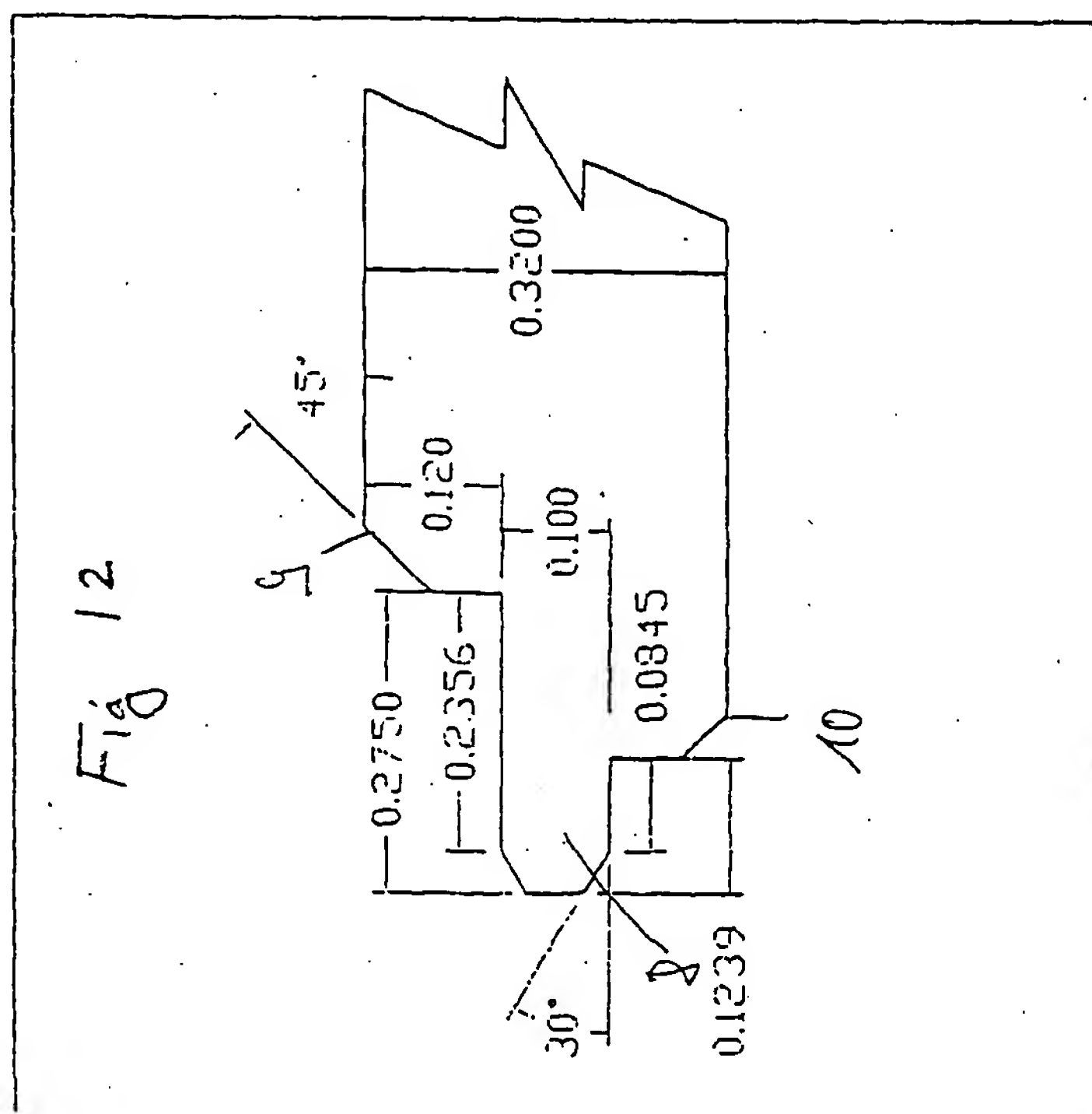inserting in the grooves of the
square tiles

Fig 10

Isometric view representing tongue
portion of board

Fig. 13

8

2D Drawing representing tongue
portion of board

Fig. 12

45°

0.120

0.2750

0.2356

0.100

0.3200

0.0845

30°

0.1239

8

10

Isometric view representing traverse
grout spline design

Fig 15

2D Drawing representing traverse
grout spline design

Fig 14

0.2756

0.120

0.0347

0.1556

0.0600

0.0278
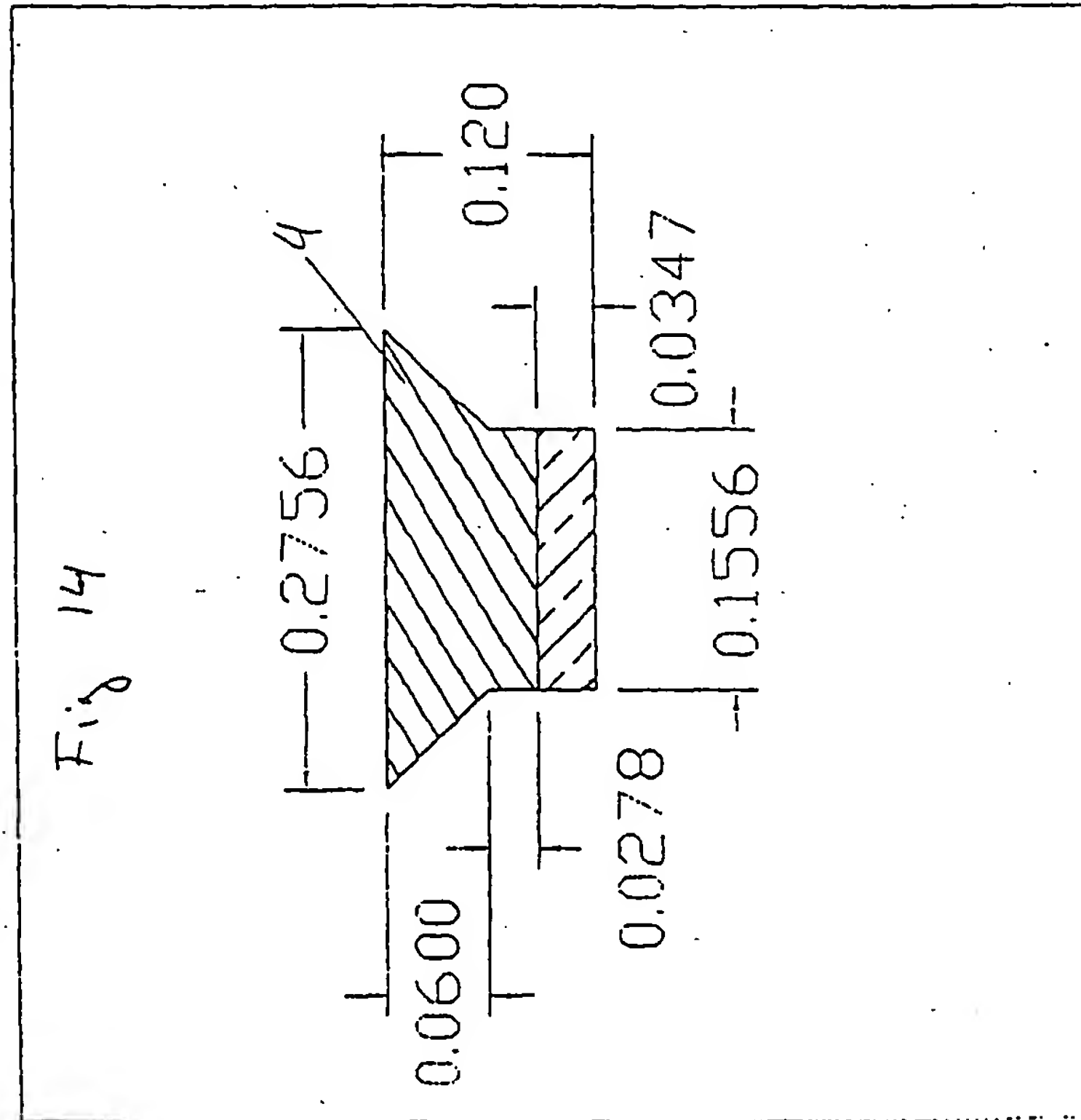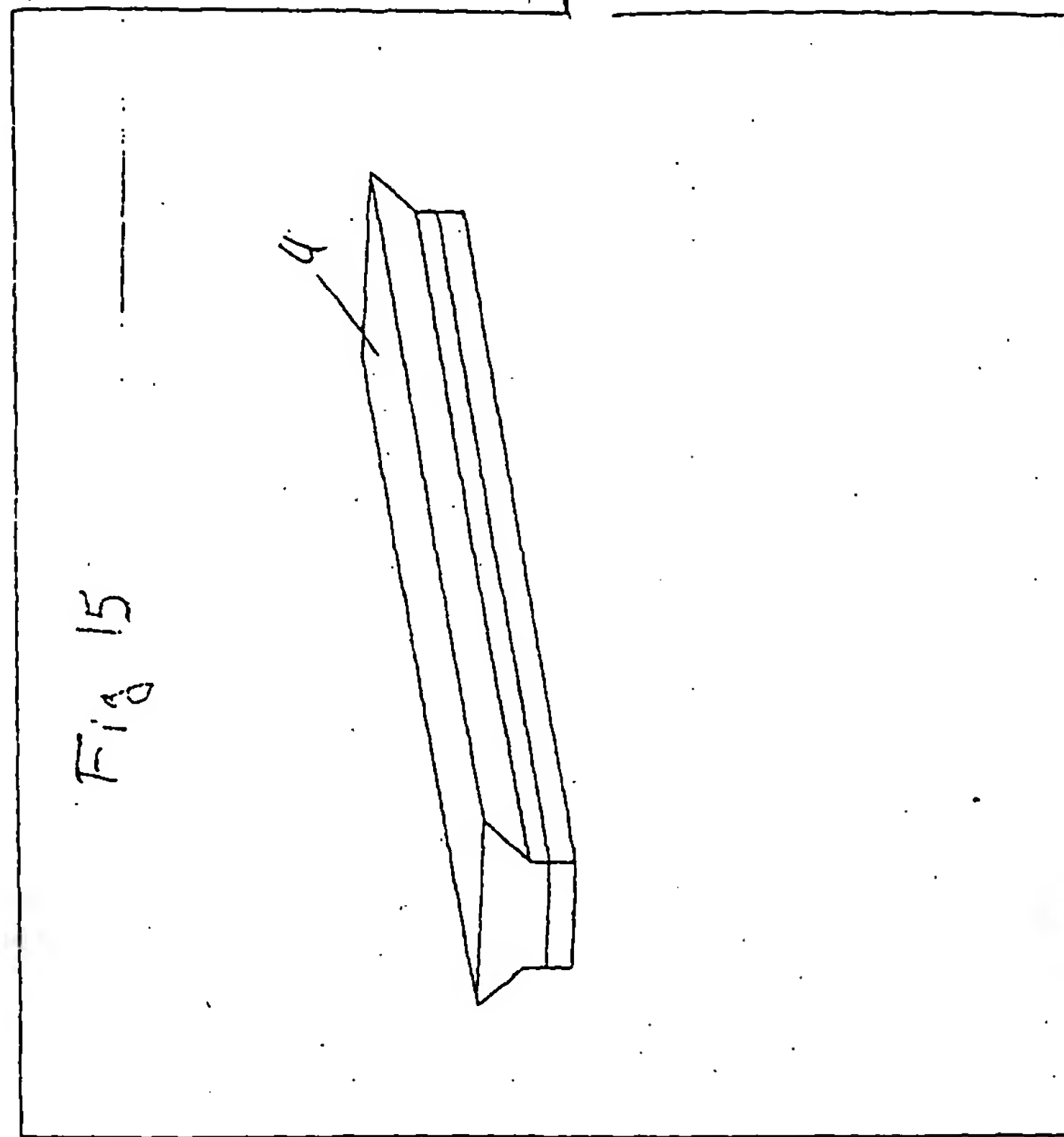
Side view of smooth
spline design

Fig 16
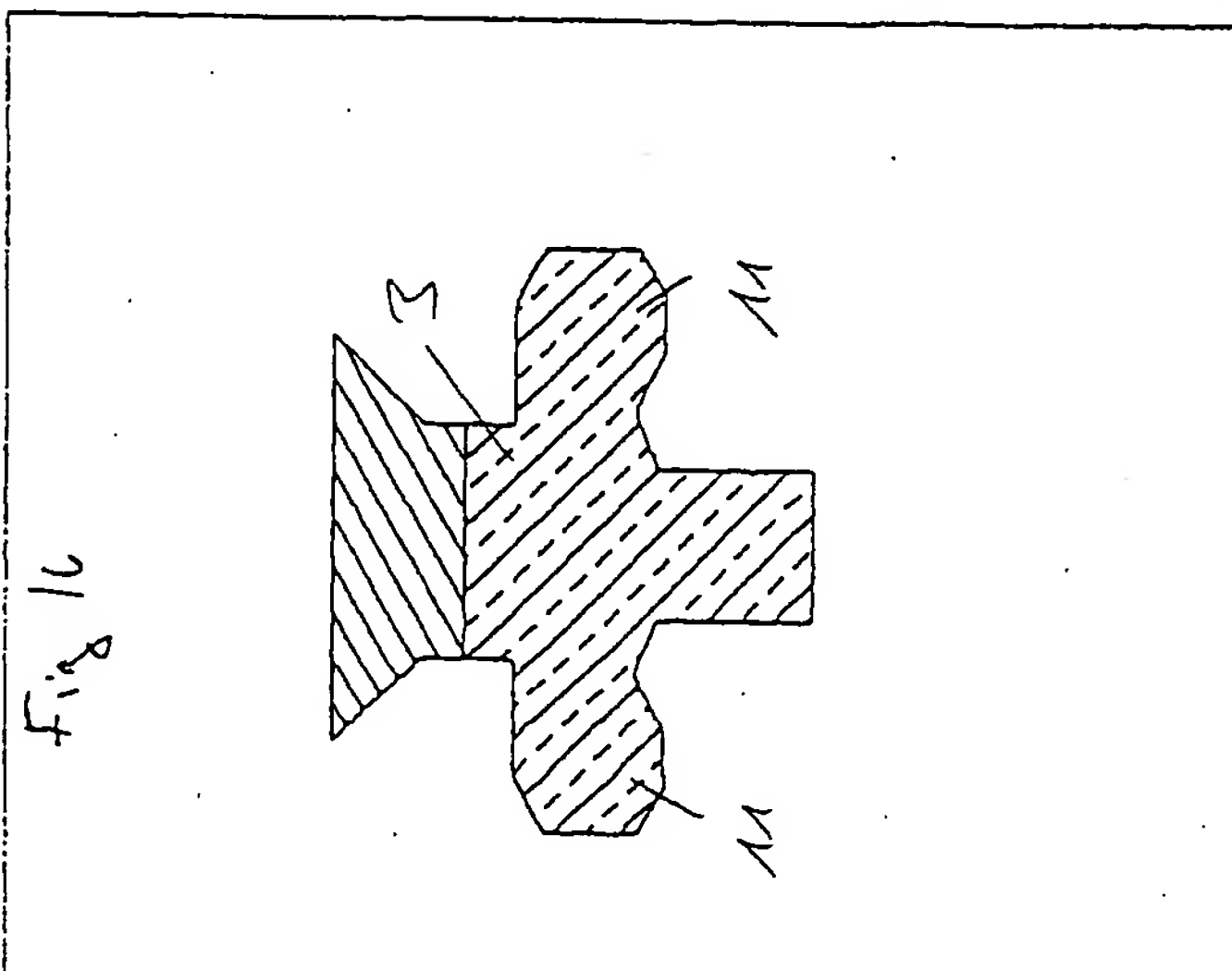
Side view of tooth-like
spline design

Fig 17
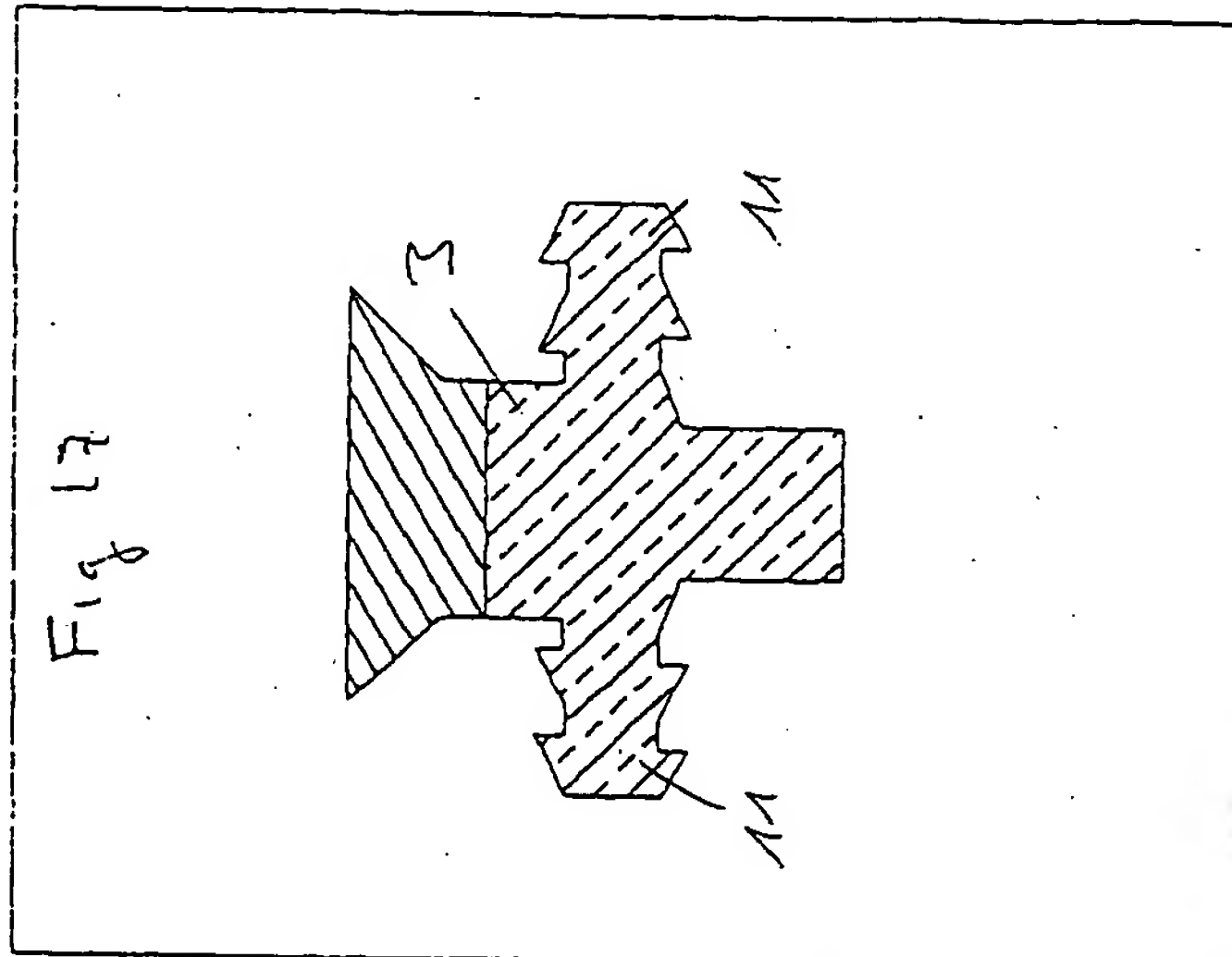
Side view of recess
spline design
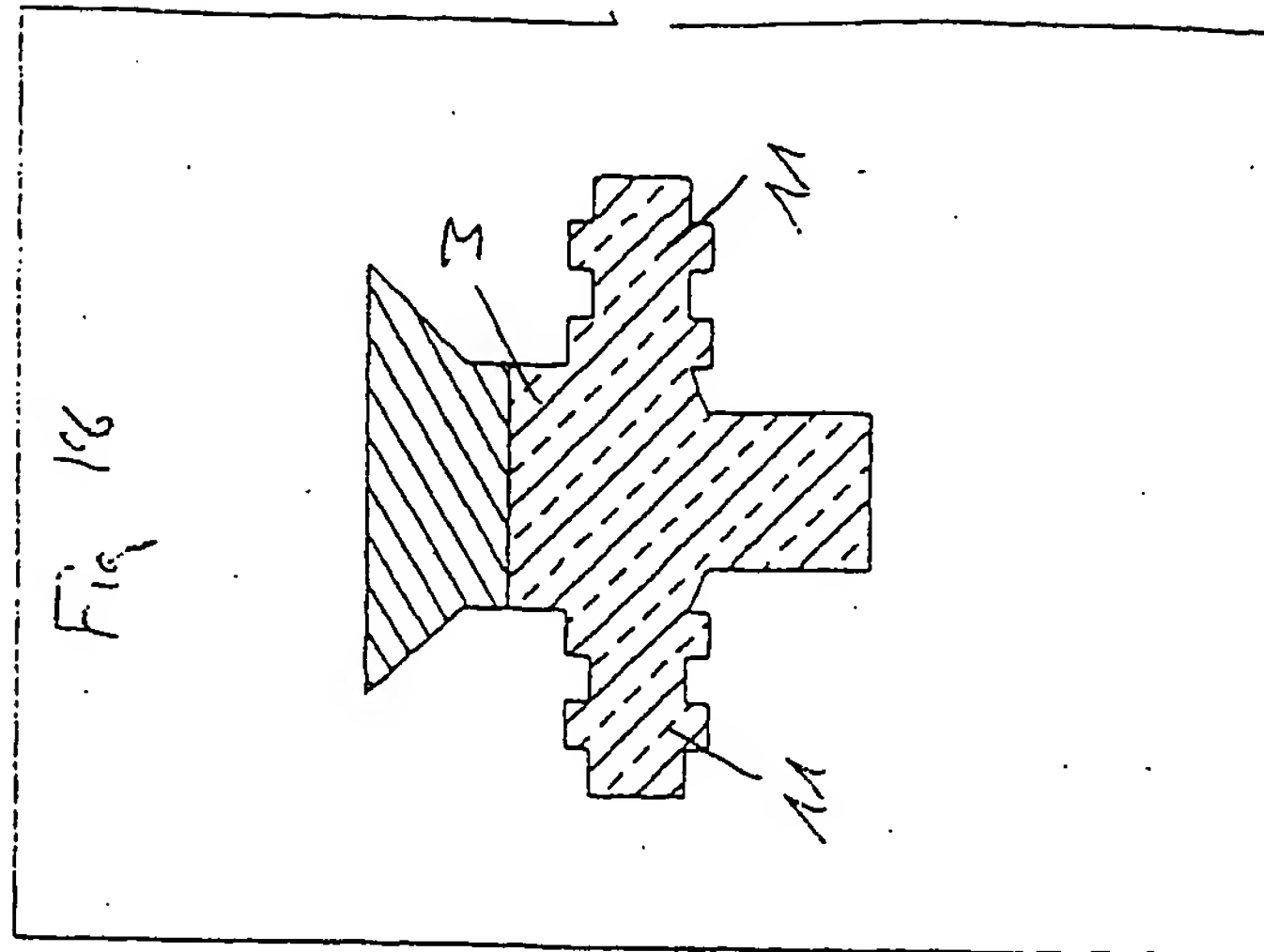
Fig 18

Isometric view representing groove
portion of board

Fig 20

2D Drawing representing groove
portion of board

Fig 19
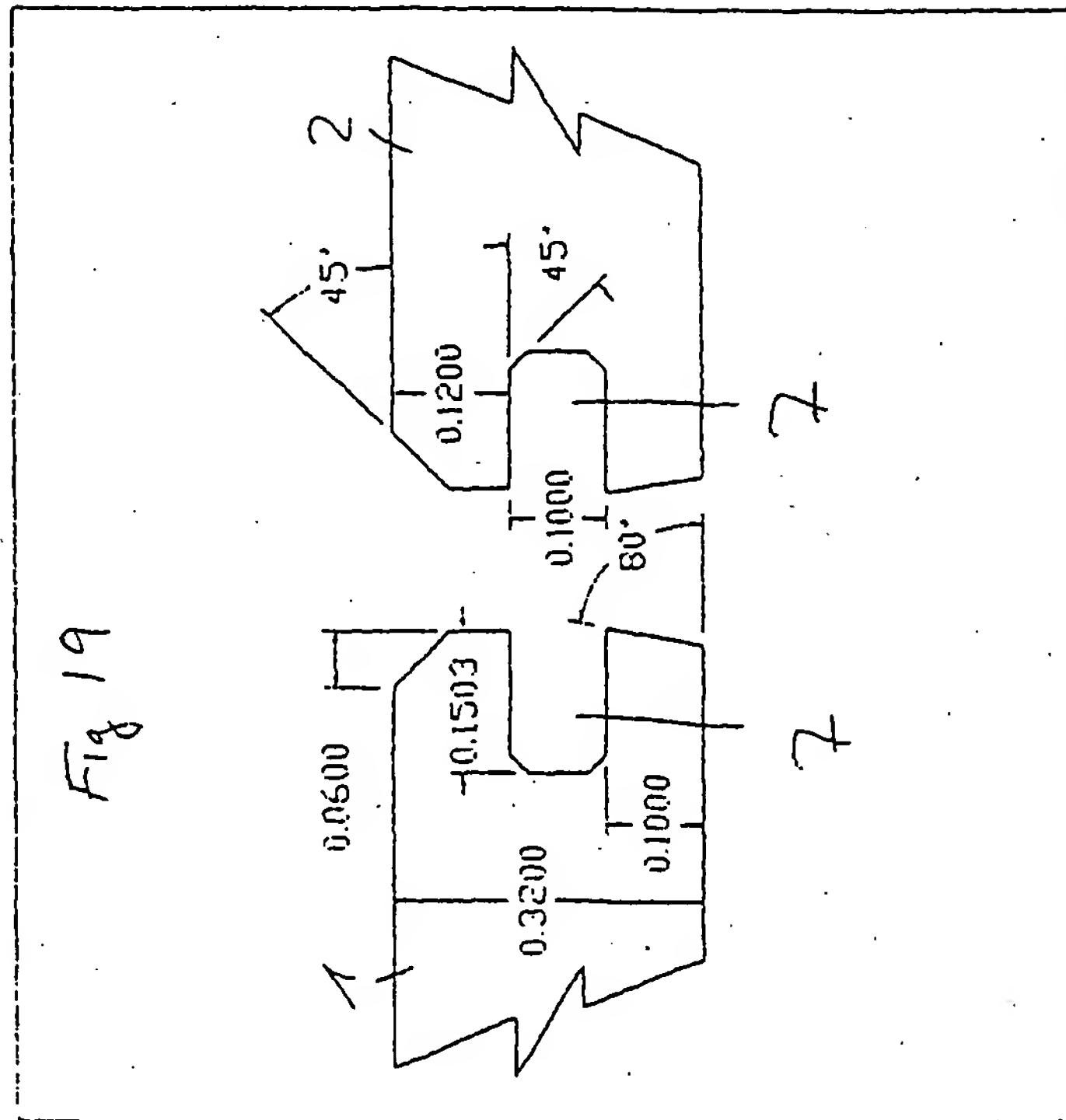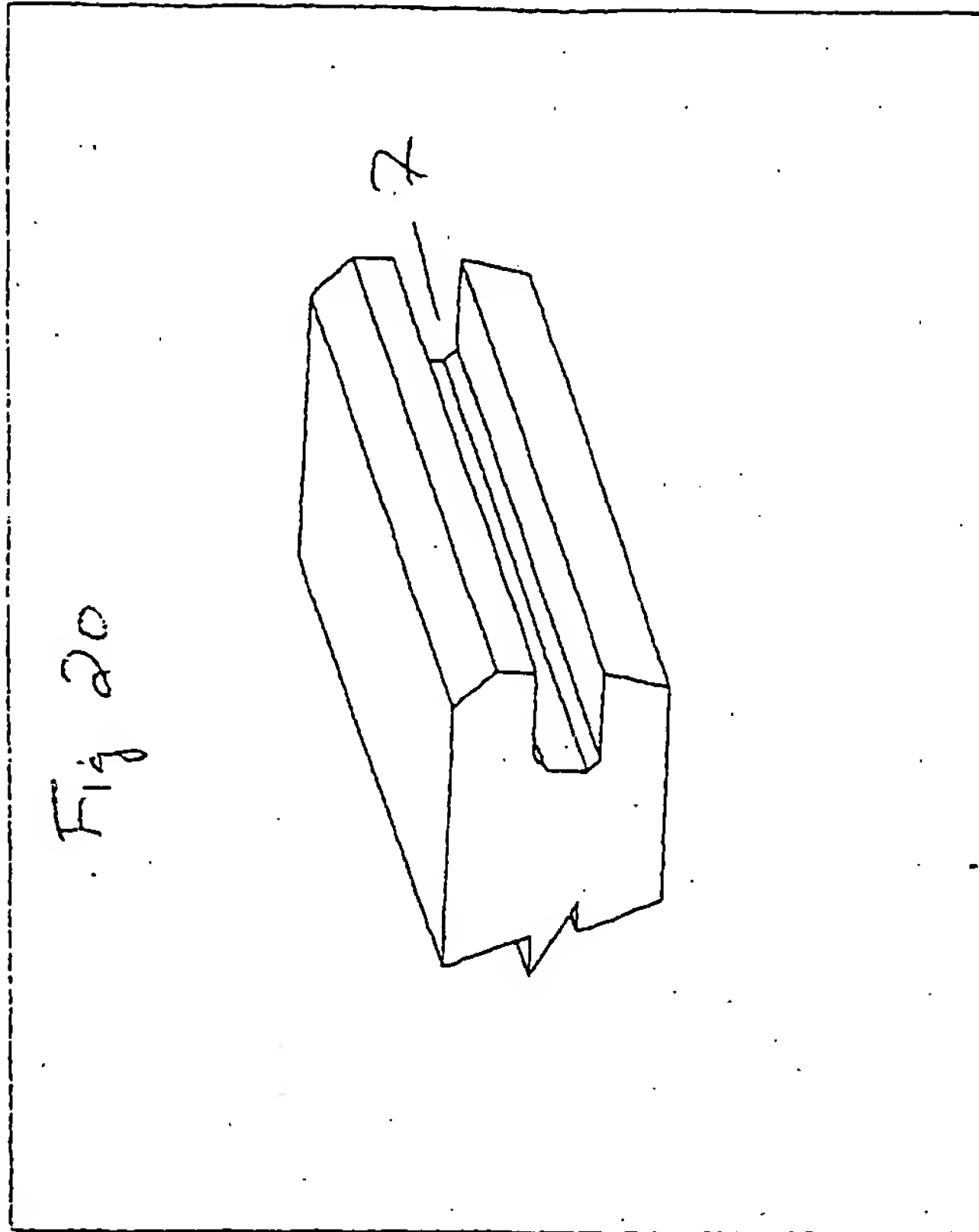
Side view of recess
groove

Fig 23
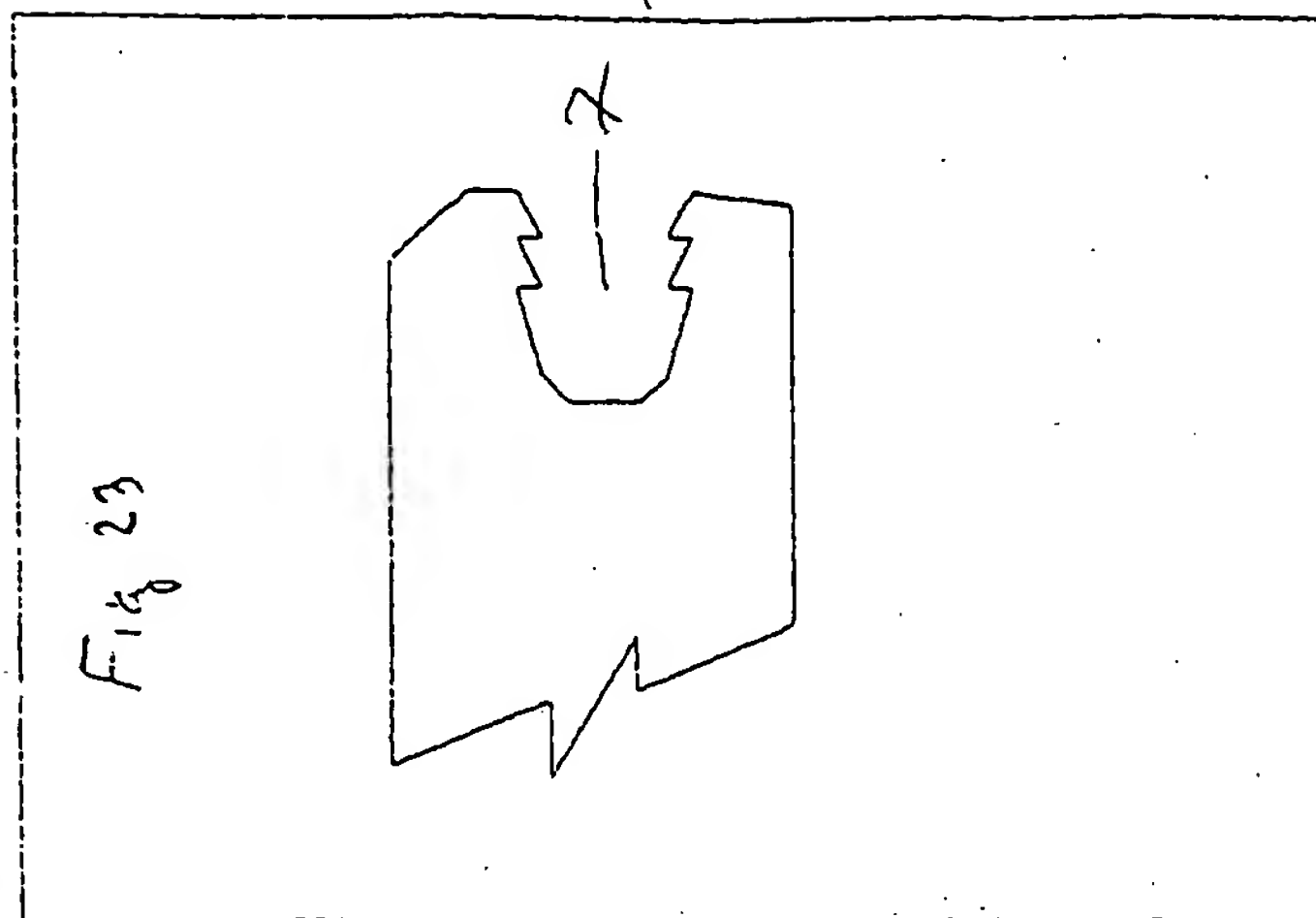
Side view of tooth-like
groove

Fig 22
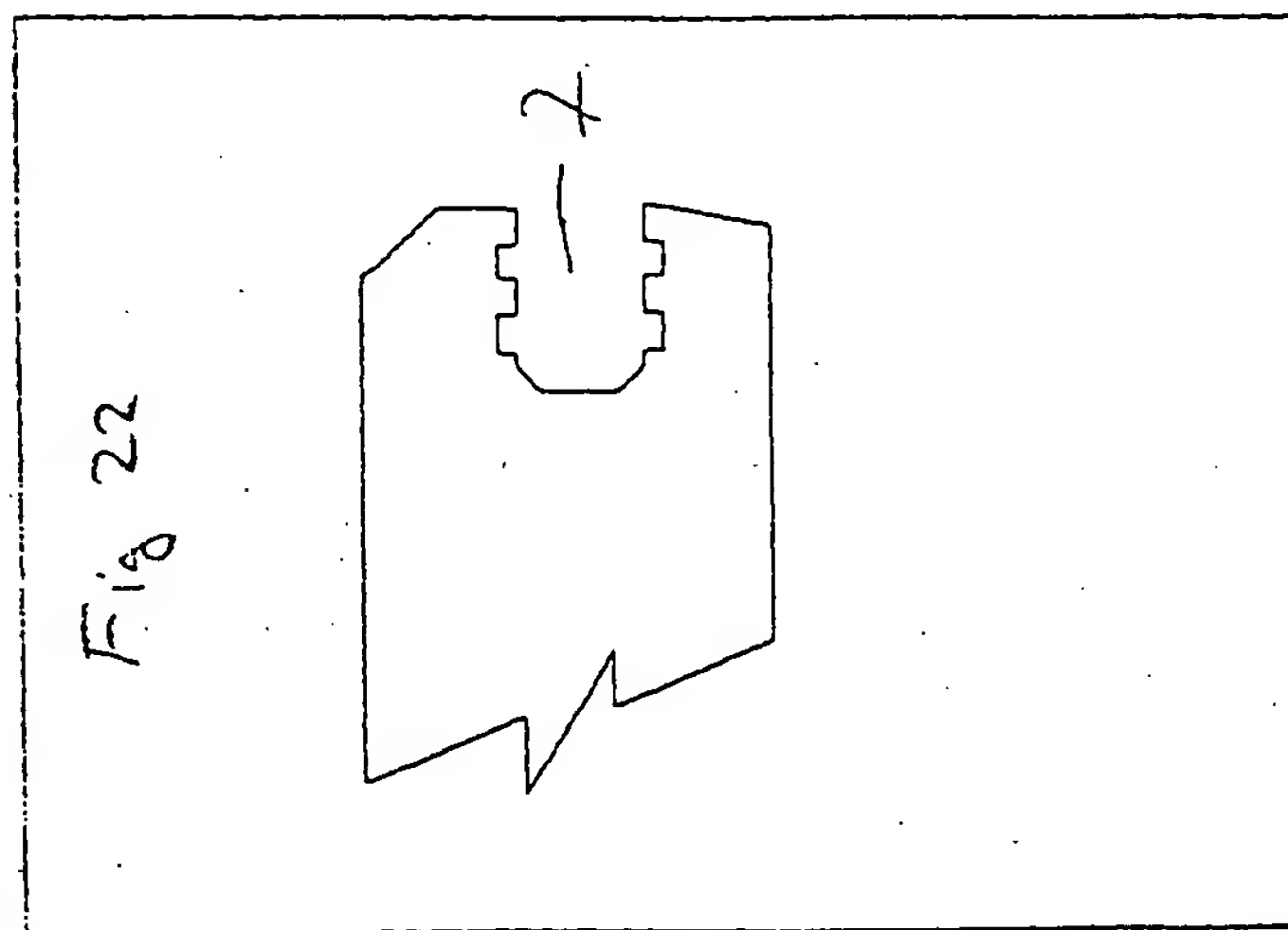
Side view of smooth
groove
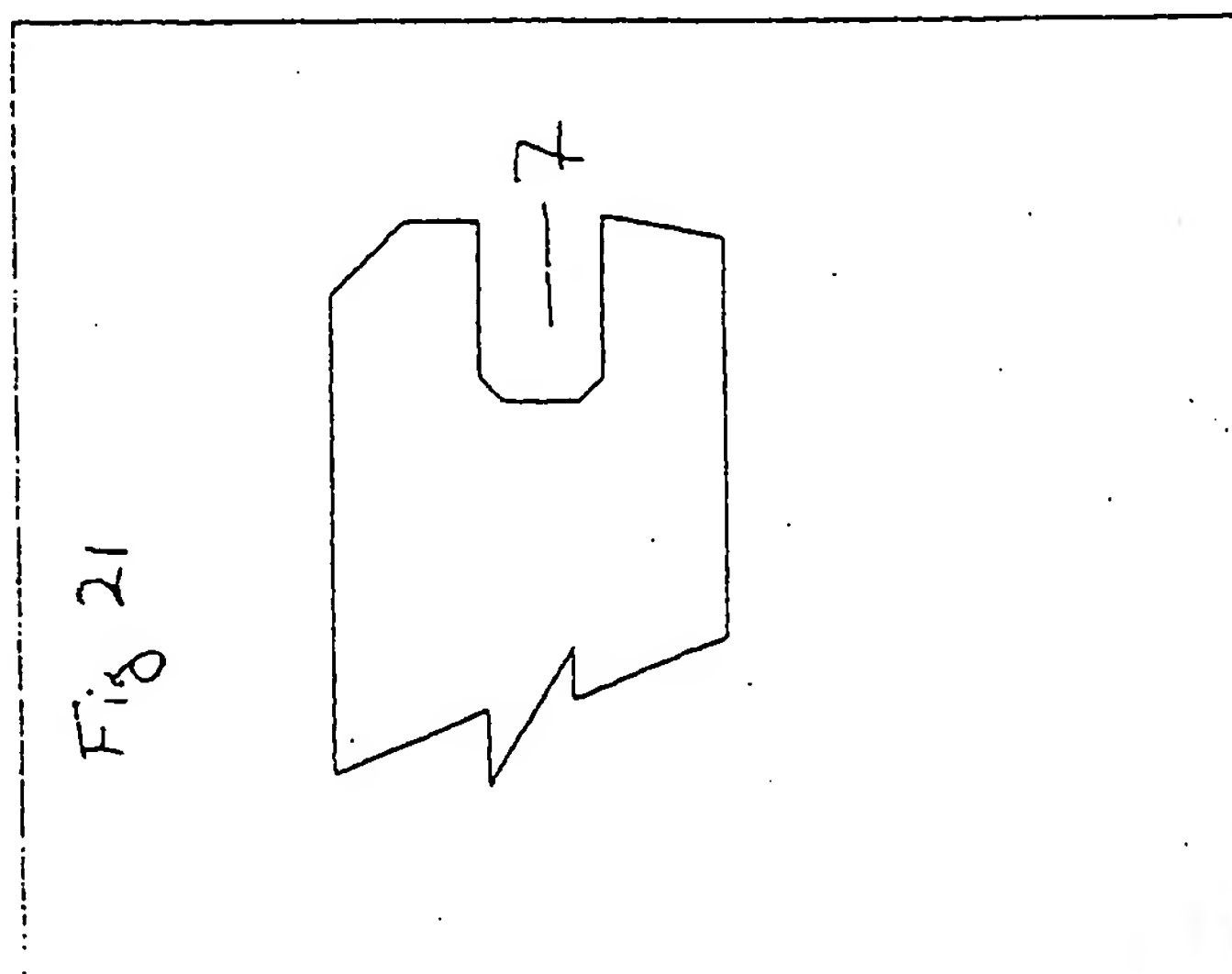
Fig 21

Isometric view representing board with 3 sides grooved and 1 side
with tongue   (Note: Image is not proportional - pattern surface dimensions are 2" X 2")

Fig. 24
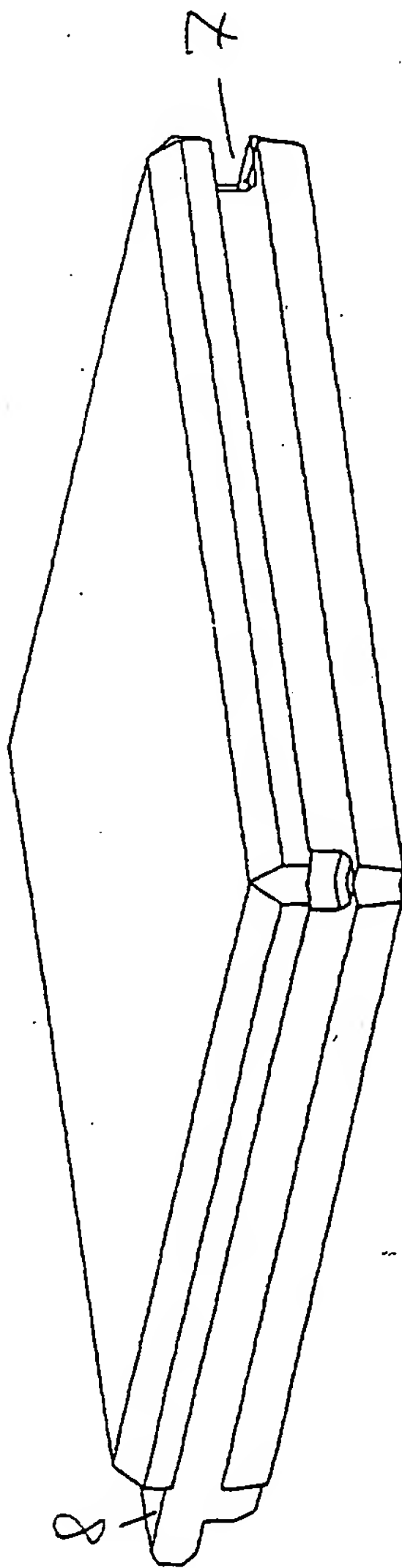
Isometric view representing board with 3 sides grooved and 1 side with tongue   (Note: Image is not proportional - pattern surface dimensions are 2" X 2")
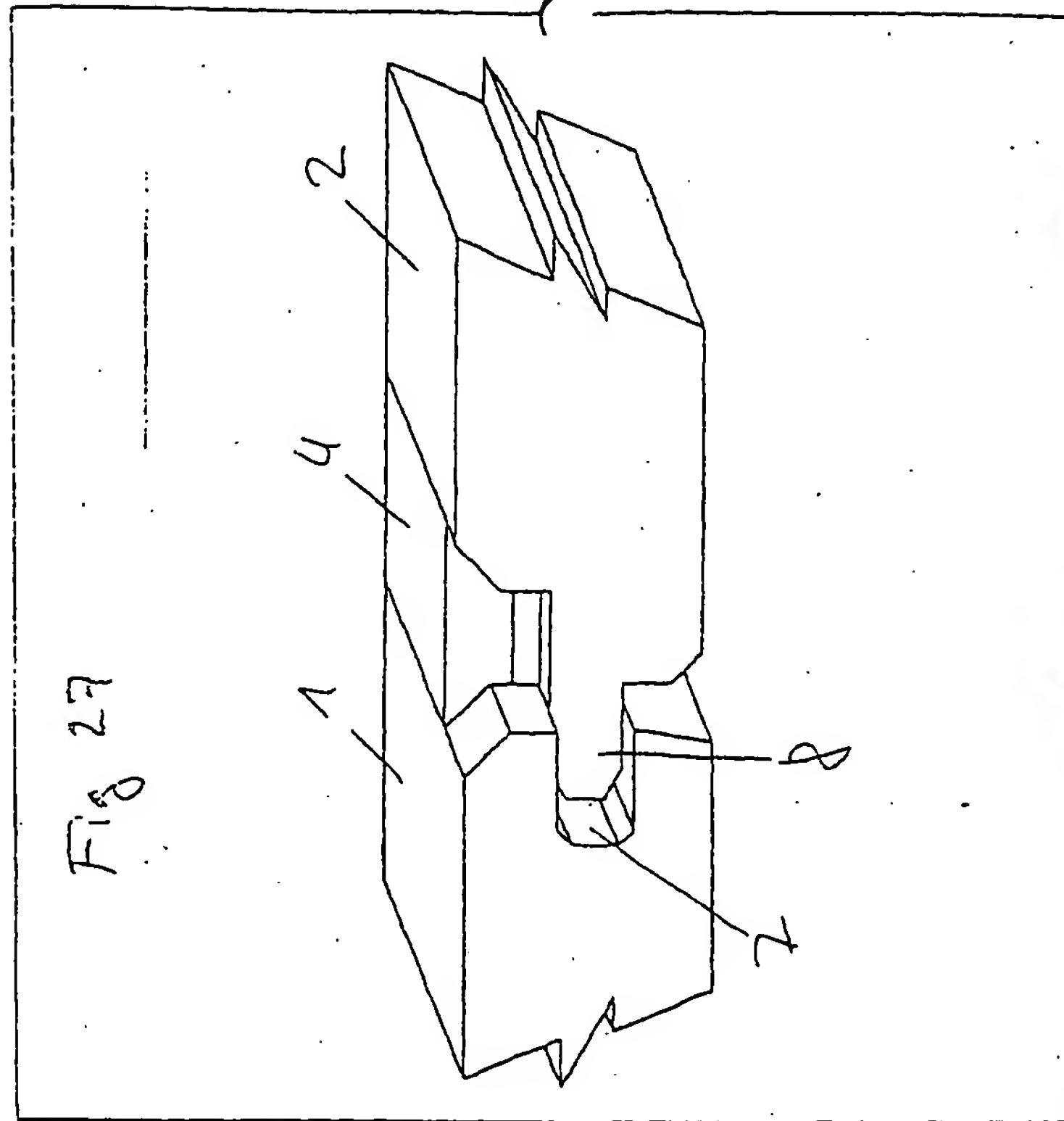

Fig 25
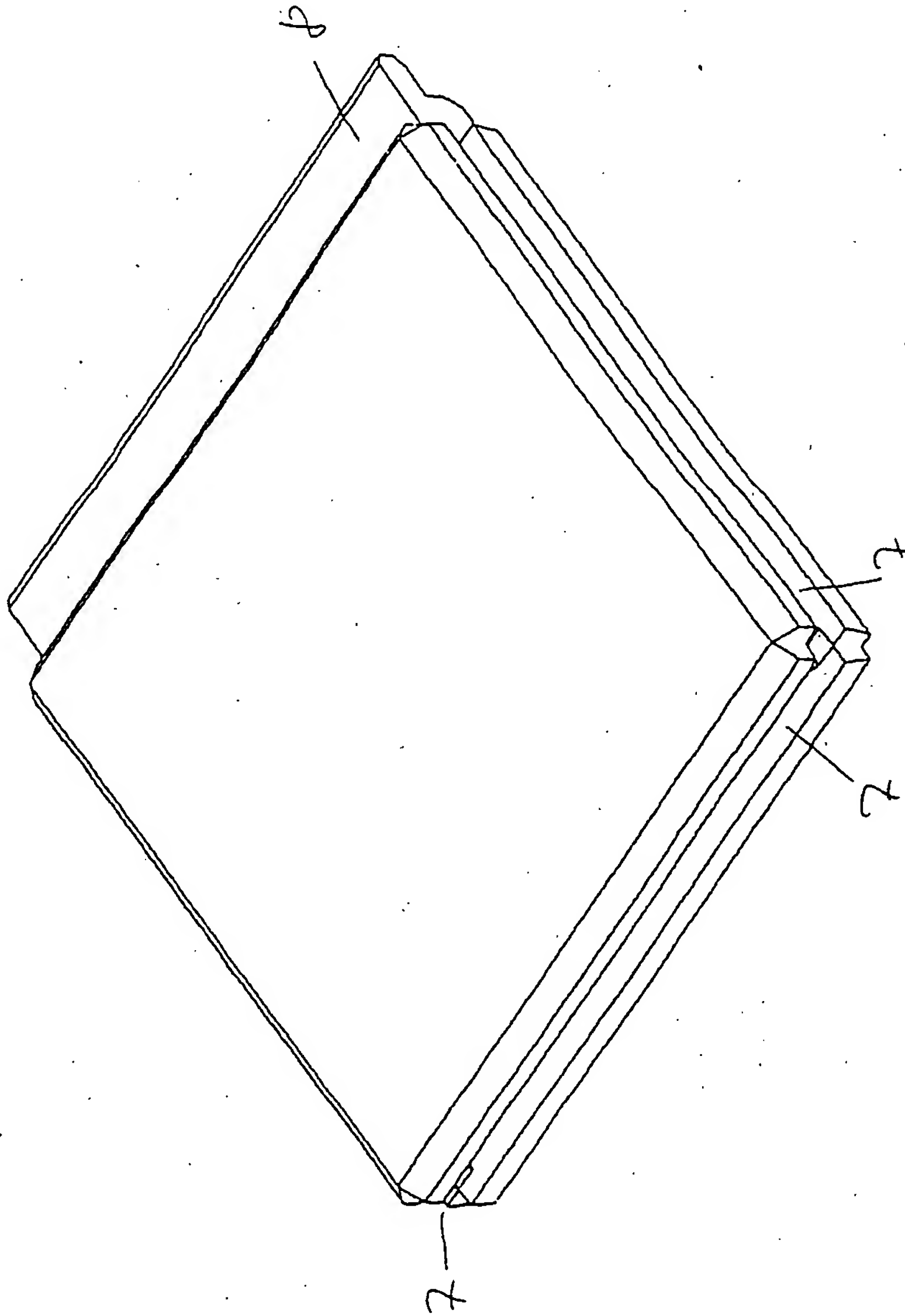
3D Drawing showing the grout
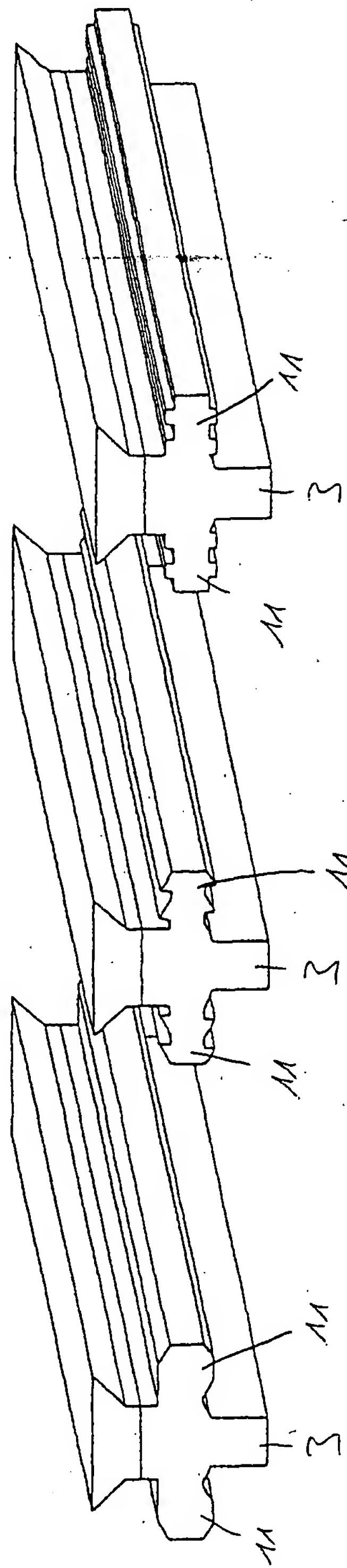spline lying on the tongue of the
square tiles

Fig 27

2D Drawing showing the grout
spline lying on the tongue of the
square tiles

Fig 26
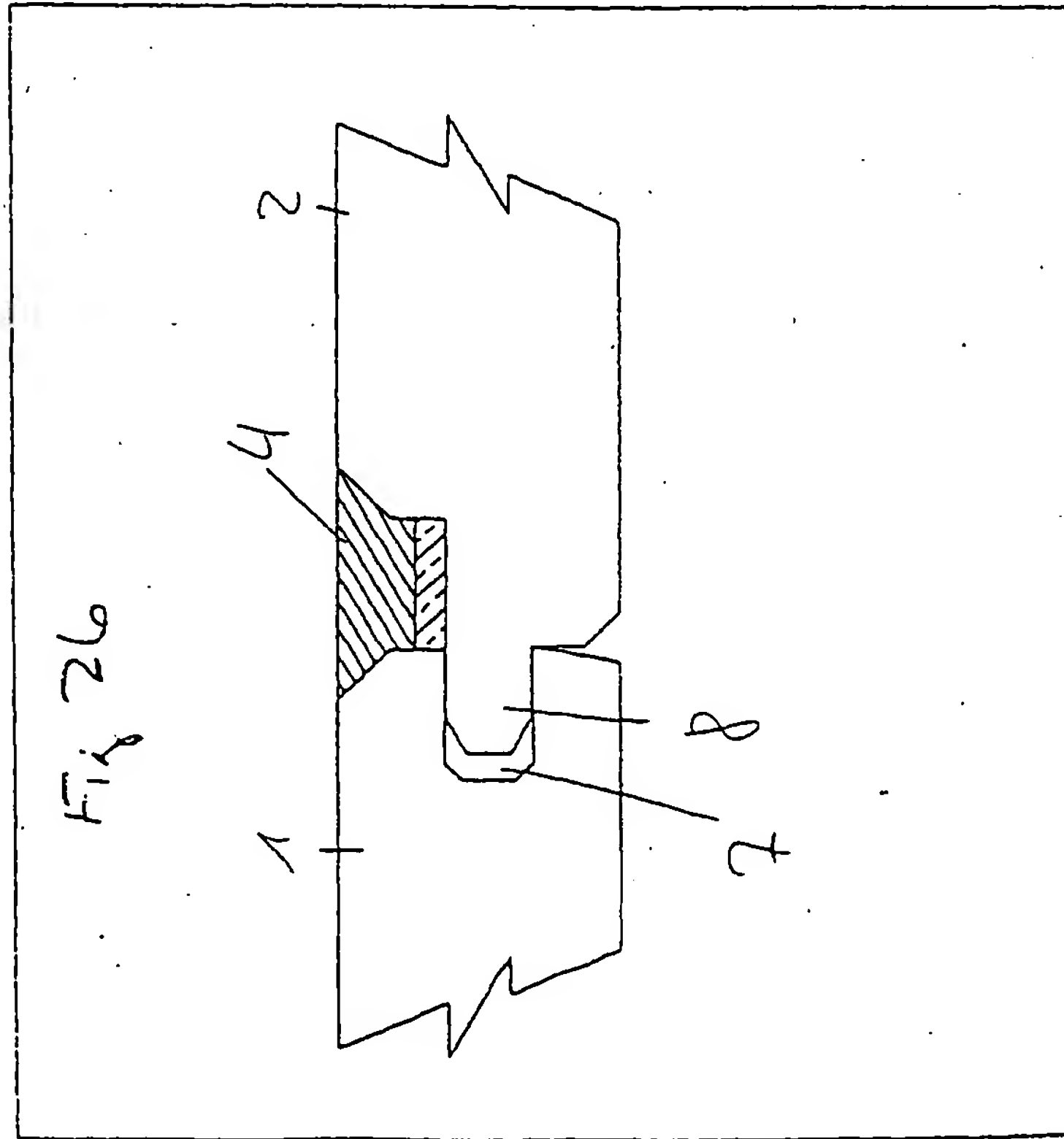
Isometric view representing smooth, tooth like and recess groove configurations

Fig 28

Isometric view showing long spline w/ notch for the traverse grout to lie on the surface

fig 29